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My apology for adding another school poetry book to the many in existence must be the usual one, that I have found nothing quite suited to my purpose. The best are too ambitious, or, at least, contain too much that is difficult, to be really fitted for little children fresh from the nursery or kindergarten, craving food, but quite unable to assimilate strong meat. It may be a mistake to "write down" to them, but it is, I think, a still

greater mistake to force good things upon them prematurely, and so create a disgust which it is difficult, in after years, to remove. Poetry intended for their use should appeal to their childish fancies, their fondness for flowers and animals, their delight in story, their mingled love of sentiment and fun. It should be simple in form, and simple in what I may call outward meaning. Some of it will unfold deeper meanings as the years go on; some will be discarded as the mind outgrows it; but all may be good of its kind, and all possess something of that quality of suggestiveness which makes it, in the best sense of the word, educational.

Trial alone can show how far the present selection fulfils the conditions I have laid down. It is intended for children from seven to ten or eleven, *i.e.* for those comprised in the Lower or Preparatory Division of High Schools. It will be found to contain (as every selection must that does not sacrifice soundness to novelty) a large number of familiar pieces, but also, I think, an unusually large number that are unfamiliar. The parts are graduated, and intended to be used simultaneously, the second being specially adapted to class reading and recitation. I may add that, though compiled in the first instance for Girls' Schools, there is nothing in the volume to unfit it for use in a Preparatory Boys' School or private school-room.

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EXTRACT FROM PREFACE

THE following poems have been compiled, on the same plan as those in the preceding volume, with a view to the Middle Forms of High Schools, *i.e.* to Girls from eleven to fourteen or fifteen. If any of them should seem too simple for eleven, my excuse must be the pleasure they have afforded to readers long past fourteen. Some favourites that will be missed have been reserved for a later volume.

I have assumed that, in the Forms contemplated, lessons in literature will be given apart from the poetry learnt by heart, and have therefore included no extracts from the plays of Shakspeare, nor (with one exception) from the longer poems of Longfellow or Scott.

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THIS third volume of my poetical series is intended primarily for the Upper Forms of High Schools; but I hope it may prove useful to students who have left school, and are now reading for themselves. I have assumed that, in either case, the masterpieces of English Literature will be read independently, and have included no extracts from the *Plays* of Shakspeare, the *Canterbury Tales*, *Paradise Lost*, or the first two books of the *Faery Queene*. Poems from Spenser onwards I have, with some reluctance, given in modern spelling; chiefly because it seemed unreasonable to do for the

contemporaries and successors of Shakspeare what no one does for Shakspeare himself. But earlier poems, Scottish Poems, and those written in dialect, I have given as they stand, confident that my readers will find them very well worth the trouble of mastering.

In this last volume I have allowed myself somewhat more freedom of choice, as regards both subject and language, than in the earlier ones. Every piece, however, has been carefully selected, and some omissions necessarily made. Where these are small, I have not in all cases called attention to them; where they are large, I have described the piece as an extract.

I need scarcely say that I have made no attempt to secure anything like a *consensus* of opinion or sentiment. These will differ in Poems as in people, and we must all learn to make allowance for such differences, and to recognise the common inspiration that underlies them.

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NEW AND REVISED EDITION

London

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HOW TO LEARN TO READ

THE ENGLISH METHOD OF TEACHING TO READ

BY

A. SONNENSCHEIN AND J. M. D. MEIKLEJOHN

London

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J. R. BLAKISTON, Esq., H.M. Chief Inspector of Schools, in his book, *The Teacher*, says: "One of the most successful teachers of reading to infants attributes her wonderful results to the following system. She takes a class of four-year old children and makes them sound accurately after her all the voices or powers of each vowel regularly used in English. . . . The teacher referred to uses Sonnenschein and Meiklejohn's *English Method of Teaching to Read.*"

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HOW TO LEARN TO READ.

THE ONLY TRUE METHOD.—"A most interesting lecture was given on Wednesday afternoon at the Sesame Club by Mr. A. Sonnenschein on the proper method for teaching to read English; and so convincing was the exposition that it is nothing short of astounding to learn that, although this method was known thirty years ago to Mr. W. E. Forster, who fully admitted its claim on the most serious attention of the educational authorities of the country, yet it is to-day only known to comparatively few, instead of being, as it unquestionably should be, the accepted method in every elementary school in the country. For Mr. Sonnenschein not only claims, but has himself proved experimentally that the claim is well founded, that by it the process of learning to read fluently should occupy some five or six months only, whereas it commonly takes not less than three or four years.

"METHOD DETERMINED BY LANGUAGE.—The lecturer began by explaining that there are three ways of teaching reading:—(1) the 'Literal,' or reading by spelling the whole word; (2) the 'Syllabic' or 'phonic' method; (3) the 'Verbal,' or 'look-and-say' method in which the complete words are learned by sight. The question which of these is the proper one to adopt is determined by the language of the learner. Thus Italian, the spelling of which is practically phonetic, or German, which is largely phonetic, is best taught by the 'literal' method, because the individual letters being the true elements of the words, represent sounds derived from and based upon the child's own speech. The teacher of Italian, for example, may show the pupil a picture of a donkey, and ask its name. The child answers 'asino.' By slow, deliberate pronunciation and analysis of sounds, the teacher can resolve the word into its elemental sounds *a*, *s*, *i*, *n*, *o*. The child has now learnt the symbols of three of the five vowels and of two consonants. And now the teacher can build up the familar Italian words:—Si, no, io, sino, sano, sono, naso, &c., and even short sentences such as 'Io non so,' 'Nina non sa.' Although German is not equally simple, the same principle governs the teaching—the principle being the gradual introduction of words by which the whole alphabet is taught first functionally, and not till afterwards by the names of the letters. Italian children, as a matter of fact, learn to read in about three months, and German children in less than eight.

"THE ENGLISH METHOD IS SYLLABIC.—In a language like English or French, where simple sounds are often represented by combinations of letters, the true elements of words so far as the spelling is concerned are syllables; and the 'Syllabic' method is indispensable. Mr. Sonnenschein showed by examples that the French child has a harder task

than the English in learning to read, yet he accomplishes the task to which we devote three or four years at least, in twelve months. It is a great mistake to suppose that English spelling is exceptionally full of anomalies. They are much more numerous in French. English presents a large mass of phenomena, but they fall easily into classification, the exception to rule being in reality rare. To teach the English child to read, the teacher must present to the learner in systematic and graduated sequence all the phenomena of English reading and spelling.

"How to Teach the Alphabet.—The old-fashioned way of teaching the alphabet is a fundamental mistake. The names of the letters are essentially misleading. 'Ay tea' (A.T.) cannot rationally be made to coalesce into 'At'; nor 'Aitch ay tea' into 'Hat.' Phonetically these combinations would make 'Ate' and 'Hate.' But the chief objection to the current method is the impossibility of distinguishing the sounds of our English vowels without an accompanying consonant. As, therefore, the functions of the vowels can only be taught when joined to consonants, we are driven to accept the 'syllabic method' in teaching English reading.

"In order to present a graduated course of study in which the phenomena of the language are classified, Mr. Sonnenschein divides the subject into four well-defined sections or courses. The first of these consists of *short vowels* with only one consonant after on or both sides of it, as in 'at,' 'cat,' &c. In this first course the child learns some six hundred monosyllabic words with only very few anomalies, and these few can be arranged in categories. Thus in the series '*at, et, it, ot, ut*,' the child becomes acquainted with fifty-one complete words and forty-seven syllables forming parts of other words to be learnt afterwards; and in all these ninety-eight combinations of letters there is only a single anomaly of pronunciation, viz., '*put*,' and this anomaly itself takes its place in a further classification with such words as *push, pull, bull, full*, &c. Moreover, the child is made acquainted with that peculiar English feature, the influence of letters on their neighbours. Thus the 'w' and 'qu' regularly alter the sound of an 'a' and sometimes of an 'o' following them. Compare, for instance, the sound of '*bar*' with '*war*,' '*harm*' with '*warm*,' and '*lash*' with '*wash*' and '*quash*.'

"The Next Step.—Then comes a second course, still of short vowels with *combinations of consonants* on either or both sides of it, *e.g.*, '*flat*,' '*grip*,' '*sent*,' '*spent*,' '*stand*,' '*strand*,' &c. This course makes the child acquainted with from six to seven hundred words, with only about sixteen anomalies. Up to this point the young reader has mastered some fifteen hundred words with not more than two per cent. of deviations from regularity.

"The third course introduces the learner to *long vowels*. Here the teacher points out that *if the vowel precedes the consonant it is always short*, as the 'a' in 'absent'; while *if it follows it, it is almost always long*, as the 'a' in 'basin.' If the vowel preceding the consonant is intended to be long, this is indicated by a mute 'e' after the consonant: cf. '*hat*,' '*hate*'; '*met*,' '*mete*'; '*pin*,' '*pine*.' In five hundred words coming under this category there are only fifteen exceptions. The sum

total so far for two thousand words gives no more than three per cent. of exceptions. So much for the supposed irregularity of English.

"The fourth and last course deals with double vowels and diphthongs, and it is here that the chief difficulty is met. But even here classification, which means simplification, is possible; and children who have mastered the first three courses, generally get over this last course in about a month or six weeks. When they have done so, they have learnt to read. There remain a certain number of anomalous words coming under no rule, *e.g.*, 'beauty,' 'aisle,' 'choir, 'lieutenant,' 'colonel.' These have to be learnt when they occur, just like proper names. The number of them is not large.

"READING AND WRITING.—Like all scientific educationists, Mr. Sonnenschein insists on the necessity of teaching reading and writing concurrently. They are complementary processes. The child should in the first instance use the printed characters; and since the syllabic method necessitates the training of the child to pronounce clearly every component syllable of each word, it has the enormous incidental advantage of producing distinctness of speech.

"WORD-BUILDING AND ANALYSIS.—When children engage in promiscuous reading—as they quickly do when taught by this method—they come across long words of many syllables. These present little difficulty if the learners have been trained in word-building and word-analysis—*i.e.*, breaking up words into their component syllables. Thus having mastered at an early stage such a word as '*point*,' the child finds no difficulty in building up successively 'appoint,' 'dis-ap-point,' 'dis-ap-point-ment.' Or, to take a more difficult example, he has learnt the elementary sounds 'ar' and 'arc'; he has also learnt that an 'e' added to this has the effect of softening the 'c' and modifying the sound of the 'a,' and he is thus easily led to 'scarce' and 'scarcely.'

"VERY SIMPLE IN PRACTICE.—This may all look complicated and difficult when formally described; but in actual practice it is simplicity itself. And, after all, the proof of the pudding is in the eating. Mr. Sonnenschein lately showed the work of a boy taught by this method to Her Majesty's Chief Inspector of Schools at the Education Office, and this high educational official, amazed at the results exhibited, was utterly incredulous when assured that the boy in question was by no means a pupil of exceptional ability. This child began to learn to read on February 14th of the present year, with the first course described above—at, et, it, ot, ut. By the end of the month he could read, and *write from dictation* (not copying) such sentences as 'Do not push my kid into the bush.' After two months' teaching he could similarly write correctly from dictation a sentence of such questionable accuracy as 'From London to Chatham and Dover is a quick run and quickly over.' On May 3rd he spontaneously produced an original composition in the shape of a little story; and by the middle of June—*i.e.*, after four months from commencing his lessons in reading, he was able to take up and read with ease any page of a distinctly advanced collection of stories which included selections from Grimm's *Tales*.

"Mr. Sonnenschein insists that this is no exceptional case in his experience. No average English boy, if taught by the proper method, should take more than five or six months in learning to read with complete fluency up to the standard of his thought-capacity. Yet our

public elementary schools go blundering on with teaching that takes years to produce inferior results; and the School Board spends its energy in fighting for extension of the school age, or for continuation classes for children whose years have been stupidly wasted by labouring to acquire the elements through unscientific and obsolete methods of learning."

A WORD TO SCHOOL BOARD ELECTORS

"The lecture delivered at the Sesame Club by Mr. Sonnenschein, reported in another column, comes at an opportune moment on the eve of the elections for the London School Board. We commend it to the serious attention of that numerous body of electors who sincerely desire to obtain a Board that will do something for the furtherance of efficient elementary education, but who are at a loss to discover any clear-cut principle making for that end in the professions of candidates of either party, or in the purposeless wrangling that forms the staple of School Board electioneering. Whatever else Progressives and Moderates may dispute about, it is, by the common consent of all, the first duty of the Board Schools to teach the children to read and write. At present the art of reading is only acquired after some three or four years of schooling, and even then it is often imperfectly and unintelligently mastered. The contrast presented by the Continent in this respect is not creditable to English intelligence. Italian children learn to read easily in three or four months, and French and German children in less than a year. English is not a more difficult language for a native to learn to read than German, and is distinctly less difficult than French. Why do our boys and girls take three or four times longer to learn than the children of the Continent? Simply because our method of teaching is utterly unscientific. Mr. Sonnenschein has elaborated a system which is scientific; in which simplification is the result of classification; and he has found by experience that average English children taught by his method can learn to read in six or seven months with greater ease and fluency than the Board School pupil in three or four years. This is not a matter that can be dismissed as the theory of a faddist. It is a simple fact proved by experiment. And in view of the experience of the Continent it is not surprising. The length of time consumed in learning to read in this country requires explanation. Why, then, has Mr. Sonnenschein's method not been adopted long ago in every elementary school? When an inventor makes a contrivance for hastening locomotion or improving lighting it is taken in hand and applied to those purposes. When we are shown how to save time and labour in educa-

tion we let year after year pass without taking any notice. We debate the question of raising the school age, or of doing this, that, and the other for the sake of giving some education beyond the elements to the children of the country. And all the time we might if we chose solve half the problems of elementary education by exercising a small amount of intelligence. The exceedingly simple method propounded by Mr. Sonnenschein has been procurable for years past in a little series of cheap primers published by Messrs. Macmillan. It is perfectly well known at the Education Office, and has been approved—as, indeed, it could not fail to be by any person who had given the matter a moments serious attention—by the leading educational authorities. Why does the Education Office not recommend these primers for use in Board Schools? Simply because our culpably timid authorities shrink from giving the weight of their sanction to books produced by any particular firm of publishers. Rather than do so they waste the money of every ratepayer in the kingdom and the time and labour of every child in the schools. We have no hesitation in asserting that if the London School Board were to insist on the general adoption of the Sonnenschein method of teaching reading, they would introduce one of the most important educational reforms brought about since the Act of 1870. Those electors, therefore, who seek some practical and useful aim to guide them in the coming election could not do better than refuse support to candidates of either party who are unwilling to give a promise that this reform shall be at any rate given a fair examination and trial by the new Board."

THE NURSERY BOOK.

[THE NAMES OF THE LETTERS MUST *not* BE TAUGHT.]

LESSON 1.

(To be read first across, then down, till known; then teacher to point at words here and there.)

A	a	I
a	A	I
I	a	A
A	I	a
a	I	A
I	A	a

[2 words.

LESSON 2.

(To be read first across, then down, till known; then teacher to point at words here and there.)

O!

go,	so;
so,	go.

[5 words.

Exercise 1.

1. O! I go. 2. I go so. 3. so I go.
4. go I so? 5. so go I.

Lesson 3.

(*To be read first across, then down, till known; then* etc.)

lo	no	ho
ho	lo	no
no	lo	ho
lo	ho	no
ho	no	lo
no	ho	lo

[8 words.

Lesson 4.

(*Recap.*)

(*To be read first across, then down, till known; then* etc.)

go	no	so	lo	ho
no	go	lo	ho	so
so	ho	go	no	lo
lo	so	ho	go	no
ho	lo	no	so	go

[8 words.

Exercise 2.

1. lo I go so.
2. lo so I go.
3. go I so?
4. no. O no!

LESSON 10.

(*All the syllables in* l *to be practised first, then those in* m ; *and then both alternately. To be read first across,* etc.)

lat	let	lit	lot	lut
mat	met	mit	mot	mut
let	lat	lot	lut	lit
met	mat	mot	mut	mit
lit	lut	lat	let	lot
mit	mut	mat	met	mot
lot	lit	lut	lat	let
mot	mit	mut	mat	met
lut	lot	let	lit	lat
mut	mot	met	mit	mat

19 words.] [40 syllables

EXERCISE 5.

1. he met me on the mat.
2. she let the ox go up on the hut.
3. I let the lot go.
4. we met a shy ox.
5. it is on the mat, is it to go?
6. Let me in.
7. the hat is on the mat.
8. the fat ox is let into the hut.
9. we met the fat ox.
10. he lit up the hut.
11. hit the fat ox.
12. let me go.

LESSON 11.

(*All the syllables in* n *to be practised first, then those in* m, *then those in* p; *and then together. To be read first across, etc.*)

mat	met	mit	mot	mut
nat	net	nit	not	nut
met	mat	mot	mut	mit
net	nat	not	nut	nit
pet	pat	pot	*put* *	pit
mit	mut	mat	met	mot
nit	nut	nat	net	not
pit	*put* *	pat	pet	pot
mot	mit	mut	mat	met
not	nit	nut	nat	net
pot	pit	*put* *	pat	pet
mut	mot	met	mit	mat
nut	not	net	nit	nat
put *	pot	pet	pit	pat

27 words.] [50 syllables.

EXERCISE 6.

1. it is a nut.
2. no, it is not a nut.
3. the net is on the ox.
4. is she the pet?

* The Teacher will be so good as to call attention to this exception—as it will by-and-by justify *push*, *pull*, *puss*, etc. etc.

3. This girth is longer than I want.
4. Did he go north?
5. This bird is not worth very much.
6. He got very swarthy by sitting so much in the sun.
7. You will not find swarthy men in the north; black men dwell in hot lands.
8. The firth of Forth is in Scot-land.
9. Scot-land is the land of his birth.
10. Sum-mer is full of mirth.
11. The sun is hot, the birds sing, and the lambs run on the grassy sward.
12. Win-ter al-so is full of mirth, when we all sit together and chat or sing.

Practice XVI.

ark	erk	irk	ork	urk
erk	ark	ork	urk	irk
irk	urk	ark	erk	ork
ork	irk	urk	ark	erk
urk	ork	erk	irk	ark

LESSON 19.

bark	cork	dark	dirk	fork
hark	jerk	lark	lurk	mark
murky	park	pork	quirk	Turk
*work	York	shark	shirk	*clerk*
spark	stark	*stork	market	

er	erf	serf	ur	urf	turf
ar	arf	wharf	dwarf*	scarf*	

EXERCISE 30.

1. Bring me the bark from the log.
2. Cork is a kind of bark.
3. We had a run in the park.
4. Hark! the pretty bird is sing-ing.
5. The lark went upwards and sang.
6. Fetch me pork from the market.
7. He is not quick at his work.
8. All sparks fly upwards.
9. Do not shirk your work.
10. It is very dark and murky in the park.
11. Dogs do not snort; pigs snort and grunt, but dogs bark.
12. Hark! the bell is ringing,
    Calling us to singing;
    Hark! the bell is ringing,
    Calling us to singing.
    Run! run along!
    Let us sing a song!
    Hark! hark! the bell is ringing!

* Contrast and see Note on *w*, p. 79, First Course.

Third Course.

Exercise 1.

1. I do not hate him at all.
2. He fell into the pond and met a sad fate.
3. Open the gate and let me in.
4. Did the kite catch the bird?
5. She can sing to the lute or to the harp.
6. Barking dogs don't bite.
7. The silent dog is the first to bite.
8. You can tell a bird by its note, and a man by his talk.
9. A crate full of boxes was standing by the waggon.
10. Bring a plate, and put it on the hob of the grate.
11. Can you skate? No, I can't.
12. He did it from spite.
13. Did you write the letter?
14. Yes, I wrote it last month.
15. I wrote it on my slate first, and then on paper
16. As you mete, so it shall be meted to you.
17. The church stands on the old site.
18. The wolf killed the pretty white lamb.
19. If he runs at such a rate, I cannot catch him.
20. A bad padlock invites a picklock.

A bad padlock invites a picklock.

Lesson 2.

en	er	est	ed	ing	ish	y
bite		fate		hate		
bit-ing		fat-ed		hat-ing		

late
lat-est

mate
mat-ed

quote
quot-ing

white
whit-ish

brute
brut-ish

flute
flut-ing

grate
grat-ing

plate
plat-ed

skate
skat-ing

smite
smit-ing

write
writ-ing

fade
fad-ed

hide
hid-ing

ride
rid-ing

wide
wid-est

shade
shad-y

con-clude
con-clud-ing

glide
glid-ed

pride
prid-ed

prude
prud-ish

Exercise 2.

1. She was singing to his fluting.
2. I cannot help concluding from what you told me that he was late.
3. When the mate of the ship got on land, he put on a white hat, and dressed himself up; then he rode to London, and walked in the Strand, as far as Temple Bar.
4. The north wind is biting, cold and dry; the west wind is soft, warm and wet.
5. You can ride with me, my little lady.

You can ride with me, my little lady.

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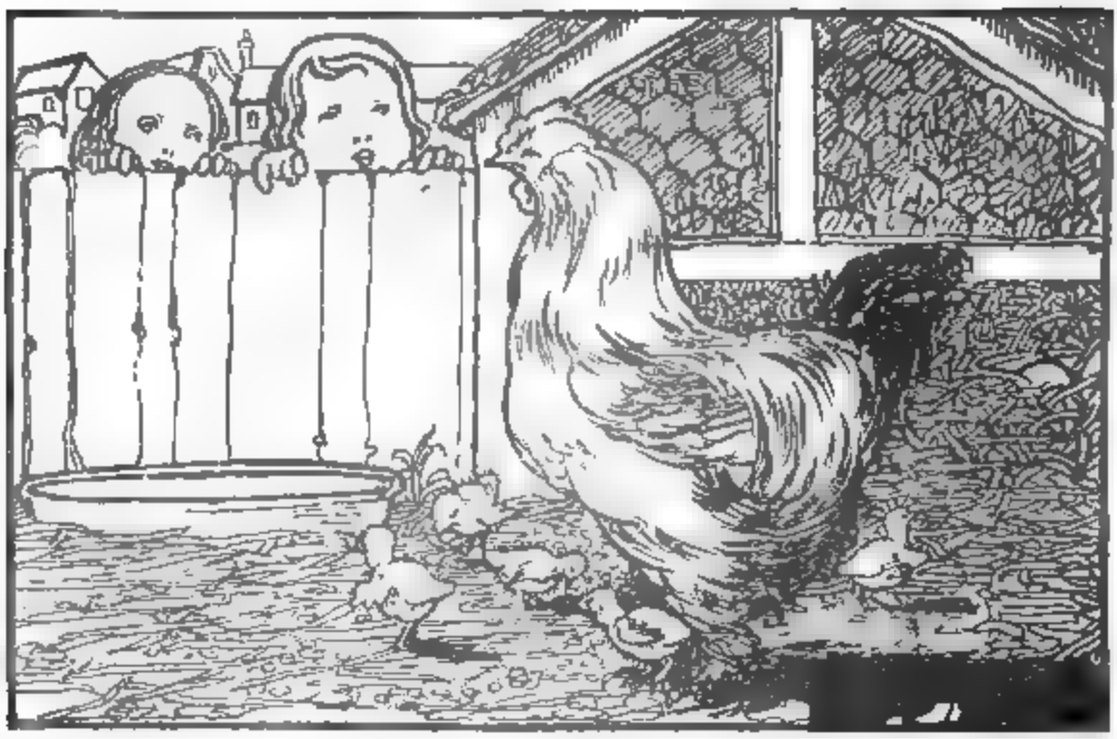
at	fat	pat
bat	hat	rat
cat	mat	sat

1. Pat sat on the mat; I sat by the cat.
2. The fat cat is at the bat.
3. A rat is in my hat. Cat, go to it.
4. The cat is fat; so is the rat.
5. He is to go to pat the fat ox.
6. My hat is on. Am I to go?

old	gold	rose
bold	hold	nose
cold	sold	bone
fold	told	stone

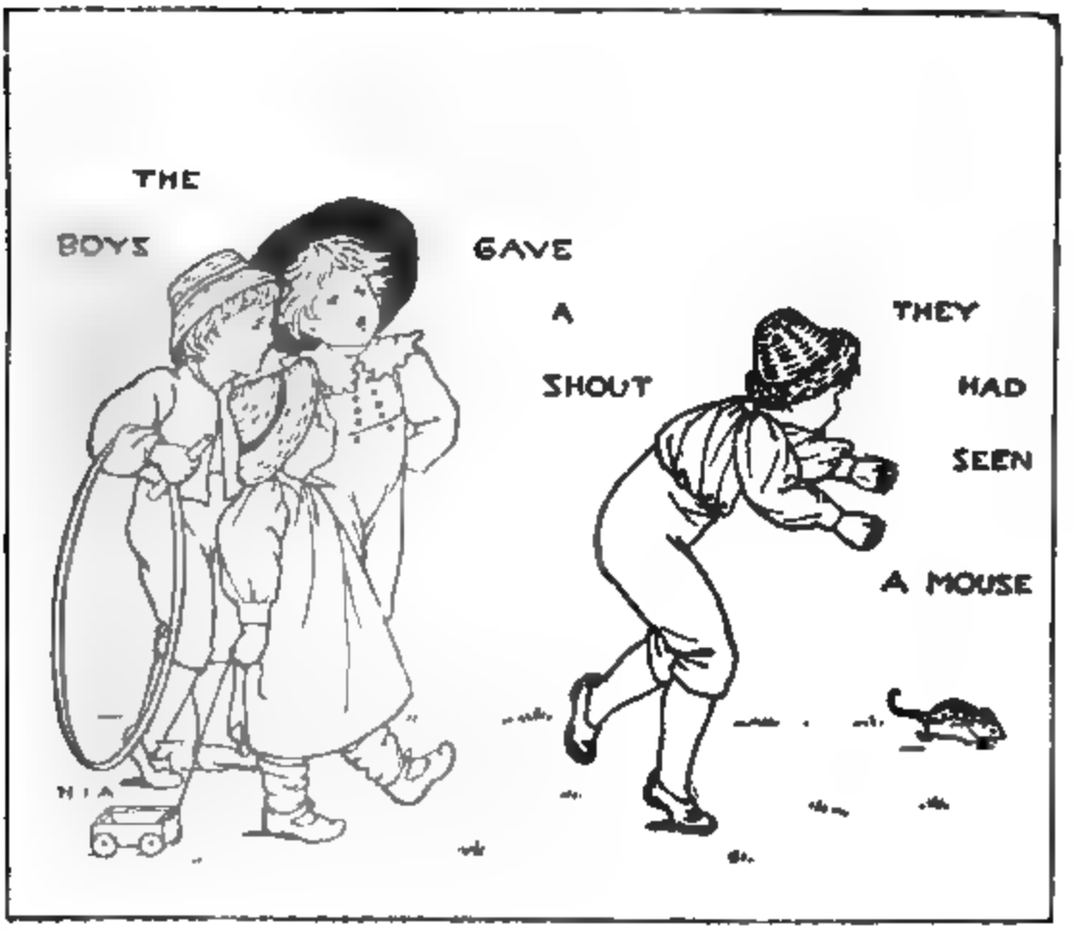
1. The old man is cold. Take him to the fire, and be kind to him.
2. Be so kind as to hold my mare, till I get on its back.
3. Tom has sold his gold pin, and he has lost his dog.



A Hen and her Chicks

brown	count	laid
white	chicks	throw

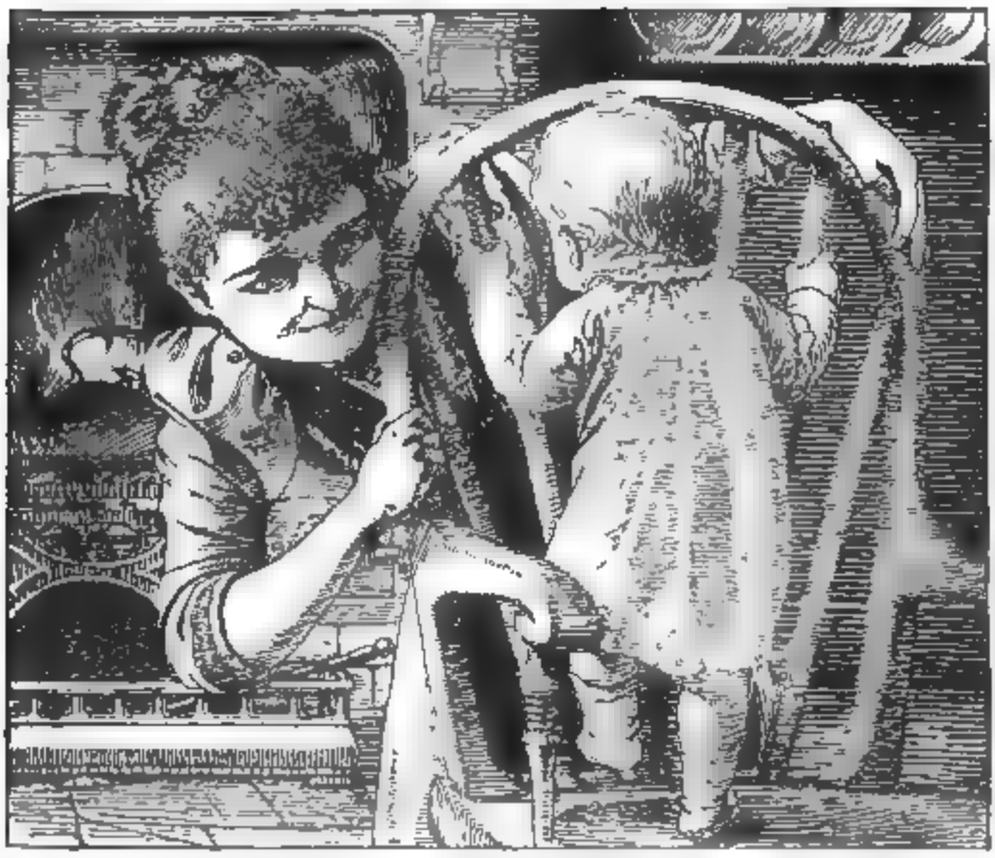
1. Here is a brown hen, with her chicks.
2. Can you count them? Yes. There are one, two, three, four, five.
3. Now we will look in the hen's nest, and see if she has laid an egg.



out	our	sound	mouse
shout	hour	round	house

1. When the boys came out to play, they gave a loud shout.

2. They had seen a mouse. It ran round the house, and went into a hole.



4.—KISSING THROUGH THE CHAIR

fun′-ny	**through**	**pok′-er**
mam-ma′	**lev′-el**	**de-cla′re**

1. Peep-bo, peep-bo!
   Kissing through the chair:
   Mamma has kissed baby
   Twice I declare!
   Like a little poker
   Stiff, baby stands:
   Stamps with his little feet,
   Pushes with his hands.

9. "They taste good," said the Wolf; "I must have more." So away he went into the kitchen; and while getting the pancakes, he upset the dish and broke it to pieces.

10. The farmer's wife heard the crash and

came running in. When she saw the Wolf, she called loudly for the farm servants, who beat him with whatever they could lay their hands on. So the Wolf came back to the Fox with two lame legs, and howling terribly.

11. "You have led me into a pretty mess,"

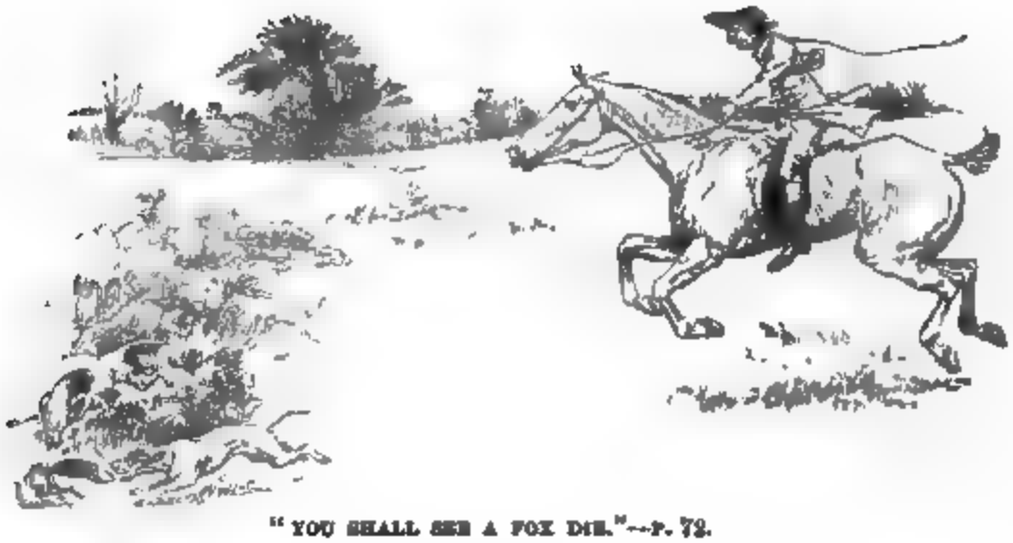
2. All our cheeks as fresh as roses,
   All our fingers as blue as our noses;
   As for our feet, we can hardly feel them,
   As for our chilblains, the snow must heal them.

Merrily, merrily, slide along;
The sun shines bright, but the ice is strong.

3. Ice so smooth, and solid, and black,
   With never a weed, or hole, or crack!
   There go the skaters, tall young men,
   Cutting our slides up. Now and then,
   Don't I like to see one of them fall,
   Just for a little harmless sprawl!

was like a new world to him. He saw great spiders there, with crowns and crosses marked on their backs, who sat in the middle of their webs, and, when they saw Tom coming, shook them so fast that they became invisible.

2. Then he saw lizards, brown, gray, and green, and thought they were snakes, and would sting him; but they were as much frightened as he, and shot away into the heath. And then, under a rock, he saw a pretty sight—a great brown, sharp-nosed creature, with a white tag to her brush, and round her four or five



"YOU SHALL SEE A FOX DIE."—P. 72.

18.—Ode to the North-East Wind

Welcome, wild North-easter!
  Shame it is to see
Odes to every zephyr;
  Ne'er a verse to thee.
Welcome, black North-easter!
  O'er the German foam;
O'er the Danish moorlands,
  From thy frozen home.
Tired we are of summer,
  Tired of gaudy glare,
Showers soft and steaming,
  Hot and breathless air.
Tired of listless dreaming,
  Through the lazy day:
Jovial wind of winter
  Turns us out to play!
Sweep the golden reed-beds;
  Crisp the lazy dyke;

said the Mock Turtle angrily: "really you are very dull!"

"You ought to be ashamed of yourself for asking

such a simple question," added the Gryphon; and then they both sat silent and looked at poor Alice, who felt ready to sink into the earth.

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few things more just or more fine than his analysis of these two poor men.

"With him there was a ploughman, was his brother— . . .
An honest labourer, and a good was he,
Living in peace and perfect charity.
God loved he best, with all his holè hertè,
At any time, though him it pleased or smertè,
And then his neighbour rightly as himself.
He oft would thresh, and also dyke and delve
For Christ His sake for every poor wight,
Withouten hire, if it lay in his might.
His tithes he ever paid full fair and well,
Both of his own labòur, and his catèl.
In a tabard, he rode upon a mare."

Herte, heart. **Smerte, displeased.**
It lay in his might, if only it was in his power. **Catel, cattle; property.**
Tabard, originally a herald's coat, then a loose blouse worn by ploughmen.
Rode upon a mare, people of quality thought this an undignified thing to do.

The Clerk of Oxford, who had not yet got a living, made a worthy companion to the Parson and the Ploughman. He was as fond of learning, and of teaching others to learn, as the Parson was of looking after his parish. The Parson and the Clerk represent the best and purest aspects of the Church that are to be found at the end of the fourteenth century.

"A Clerk there was of Oxenford also,
That unto logic had gone long ago;
As lenè was his horse as is a rake,
And he was not right fat, I undertake,
But hollow looked, and thereto soberly;
Full threadbare was his upper courtepy,
For he had got him yet no benefice,
Nor was so worldly as to take office.
For he would rather have at his bed's head,
Twenty bookès, clad in black or red,
Of Aristotle and his philosophy,
Than robes, or fiddles, or gay psaltery.
But although that he was a philosòpher,
Yet haddè he but little gold in coffer;
But all that he might of his frendès hentè,
On bokes and on lerninge he it spentè
And busily for the souls began to pray
Of them that gave him wherewith to scoleye
Of studie took he most care and most heed,
Not one word spake he morè than was need;

Lene, poor, lean. **Full, quite.**
Thereto soberly, In consequence sad.
Courtepy, a short upper coat or cloak.
Psaltery, a musical instrument something like a harp.
Hente, get. **Scoleye. study.**

[SPECIMEN PAGE]

The *Moral Essays* and the *Imitations from Horace* furnish themes not so liable to discussion. They show Pope at his best as a satirist; but they are wanting in strength of argument, and the first of them, on the *Characters of Men*, had to be entirely rearranged by Warburton. It is the weakest of the four; still it contains passages which could only have been produced by Pope. The subject of the second essay was badly chosen. In women, with perhaps one exception, Pope hardly saw anything except their faults. There is an objectionable allusion in the essay to Lady Mary Wortley Montagu, and coarse satire in the portrait of Atossa, the Duchess of Marlborough. Over the third essay, again largely altered by Warburton, Pope took great pains. Among many vigorous passages, the most notorious is the scene of the Duke of Buckingham's deathbed.

The *Imitations from Horace*, prefaced by an *Epistle to Dr. Arbuthnot*, are even more notorious for the vigour of their satire. Some of Pope's most famous dissections of character are to be found in the epistle—the attack upon Addison under the name of Atticus, the description of Lord Hervey as Sporus, and of the Duke of Marlborough as Bestia.

Atticus (Joseph Addison).

". . . But were there one whose fires
True genius kindles, and fair fame inspires;
Blest with each talent and each art to please,
And born to write, converse, and live with ease:
Should such a man, too fond to rule alone,
Bear, like the Turk, no brother near the throne,
View with him scornful, yet with jealous eyes,
And hate for arts that caused himself to rise;
Damn with faint praise, accent with civil leer,
And, without sneering, teach the rest to sneer;
Willing to wound, and yet afraid to strike,
Just hint a fault, and hesitate dislike;
Alike reserved to blame, or to commend,
A timorous foe and a suspicious friend;
Dreading ev'n fools, by flatterers besieged,
And so obliging that he ne'er obliged;
Like Cato, give his little senate laws,
And sit attentive to his own applause;
While wits and Templars every sentence raise,
And wonder with a foolish face of praise—
Who but must laugh, if such a man there be?
Who would not weep if Atticus were he?"

Pope was never in any sense a poet of the emotions. He can better be called a poet of the understanding. The one metrical form which he could control was the heroic couplet; his mastery was only over the verse belonging to his age. The

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tion, as in (*c*), (*d*), (*e*), are called **collateral** clauses. The relation is cumulative. Notice the fine effect of the ellipsis of the conjunction.

(*f*) 'The troops had never fought so well, nor had the genius of their chief ever been so conspicuous.'

Here 'nor' = 'and not,' and the relation is cumulative. Notice how 'nor' attracts the verb.

(*g*) 'He was diligent, therefore he succeeded.'

The word 'therefore' is strictly an adverb and does not join the clauses, which may be regarded as collateral, the conjunction 'and' being understood. When the second clause states a result or consequence of the first clause, it is sometimes said to be in *illative* (inferential) relation to the first. The relation is really cumulative, like that of the other examples.

(*h*) 1. 'Man is man and master of his fate.'
2. 'The water is nought and the ground barren.'

Here 'and' = 'and therefore,' 'and consequently.'

(*i*) 'I am a true Englishman; I felt to the quick for the disgrace of England.'
= I am a true Englishman, *and therefore* I felt, etc.

The second clause states a consequence of the first, and the ellipsis of 'and therefore' makes the statement specially energetic.

II. The opposition or contrast of what the clauses express: the **disjunctive relation.**

EXAMPLES

(*a*) 'Either you must get another watch, or I must get another secretary.'

The one statement is *opposed* to the other. This is sometimes called the **alternative relation,** because there is a choice between two statements.

(*b*) 'John was brave, but James was a coward.'

Here the character of John is contrasted with that of James.

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In fact they are only handles to a tool, and never can be of any use unless they are added to a blade.

NOTE. You may object that

He was running *past*
They were coming *near*
I was sitting *below*

do make quite good sense. That is true. But *past*, *near*, and *below* here answer the question *where?* and are therefore Adverbs.

As is so often the case in English, the same word may do the work of more than one Part of Speech.

31. Again, look at the following:

(*a*) The train ^ Bristol was very late.

(*b*) The book ^ table is mine.

Here we want some words to join the **Nouns** *Bristol* and *table* to the **Nouns** *train* and *book*, so as to show **which** *train* and **which** *book* we are speaking of.

We have again the blade without the handle. Let us put in a handle here also:

(*a*)

The train { from / to } Bristol was very late.

(*b*)

The book { on / under / below / beneath / close to / near / above } the table is mine.

Now we have a complete tool.

Jones, come (you) here.
Jones, I saw your father yesterday.
Jones, are you listening?

Jones is used here almost like an Interjection (see above, Section 36). It is not a part of the Statement, Question, or Command, which would not be altered in the least degree if we left out the name *Jones*. In fact we almost certainly should leave it out if we were quite sure that Jones would know that we were speaking to him.

This use of a Noun (and occasionally of a Pronoun) to call attention we may describe as the **Vocative Use** (i.e. *Calling Use*. *Voco* = I call).

In Latin we translate it by the Vocative Case.

In analysing Commands be careful not to mistake the Vocative Use of a Noun for the Subject.

Notice that it is always separated from the rest of the Sentence by a comma (,): *e.g.*

Soldiers, follow me.

Analyse as follows: *e.g.*

Soldiers, follow me through the river.

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Follow		Transitive Verb.
(*you*)		*Pronoun. Subject.*
soldiers		*Noun. Vocative Use.*
me		Pronoun. Obj. of follow.
through ... river	follow	Adv. Phrase of Place.
the	river	Definite Article.

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Exercise 20.

Insert appropriate Conjunctions in the places left blank :—

1. Either you —— I must write that letter; —— it must be sent within the next two hours. 2. You need not leave your bed —— the sun rises. 3. You must get up —— the sun rises. 4. A man must do his best, —— he may not always succeed. 5. Tell me, —— you can, —— the clock has struck six. 6. I could not find out —— he lived. 7. I did not know —— far away he was, or —— he started. 8. I am so vexed with you, —— I hardly know what to say. 9. You worked hard last year, —— this year you have been very lazy. 10. I wish to know —— you have been so lazy this year. 11. You are much more idle —— you used to be. 12. Many years have passed, —— I last saw you. 13. I hope I shall see you again this year; —— we are old friends, —— true friends are scarce. 14. You should not give up all hope, —— you have failed once. 15. He who has failed once might succeed the second time, —— he tries hard. 16. You have neglected your work, —— you knew —— you were doing wrong. 17. Wait here —— I return. 18. I was afraid —— he would not recover from that sickness. 19. Take care —— you should fall.

CHAPTER IX.—INTERJECTIONS.

15. Interjection. — Sometimes, instead of expressing our feelings by a sentence, we express them by a single word or sound, as *ah!* Such words or sounds are called **In-ter-jec-tions.**

Remember then—

An Interjection is a word or sound thrown into a sentence to express some feeling of the mind.

Exercise 21.

Point out the Interjections in the following sentences :—

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[SPECIMEN PAGE]

Exercise 27.

Pick out the Adverb-clause or clauses in the following. Show what word or phrase is qualified by every such clause, and what Adverbial relation is denoted thereby :—

1. He will succeed, because he has worked hard.
2. Men engage in some work, that they may earn a living.
3. He threatened to beat him, unless he confessed.
4. He was always honest, although he was poor.
5. This is not true, so far as I can tell.
6. He likes you as much as I do.
7. He tried for a long time before he succeeded.
8. Let us go to bed, as it is now late.
9. He walked with care, lest he should stumble.
10. I agree to this, provided you sign your name.
11. Though he punish me, yet will I trust in him.
12. He returned home, after he had finished the work.
13. Prove a friend, before you trust him.
14. When the cat's away, the mice play.
15. He persevered so steadily, that he succeeded at last.
16. I will let off this man, who has been well punished already.
17. He sees very well, considering that he is sixty years of age.
18. I gave him a prize, that he might work harder next year.
19. They deserted their former associate, who had become poor and unfortunate.
20. As the tree falls, so will it lie.
21. Ever since we left the house, it has not ceased raining.
22. I should be glad to lend you that money, if I had as much in my own pocket.
23. Murder, though it have no tongue, will yet speak.
24. Unless you leave the house at once, I will send for a policeman.
25. A jackal, while prowling about the suburbs of a town, slipped into an indigo tank ; and not being able to get out he laid himself down, so that he might be taken for dead.
26. Ambassadors were sent from Sparta, who should sue for peace.

CHAPTER XXV.—THE METHOD OF ANALYSIS.

119. Form of Analysis.—The following form will be sufficient for the purposes of this chapter. The fourth example is a Complex sentence ; the other three are Simple sentences :—

A man convinced against his will is of the same opinion still.

He made himself mean and of no reputation.

The second master of the school has been teaching my sons Euclid since Thursday last.

Whom the gods love die young.

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daughter to an indigent man of merit, or to a worthless man of wealth, replied: "I would prefer a man without wealth to wealth without a man."—*Spectator*, No. 372.

Antithesis should not be sacrificed to brevity. Compare the following, and see which of the two is the more pointed :—

(*a*) The *posthumous* fame of Buddha is far greater than what accrued to him during his life.

(*b*) The fame *which has gathered round the name of Buddha since his death* far exceeds that which accrued to him during his life.

Observe that in (*b*) not only is one clause balanced against another, but the Present Perfect tense "has gathered" is contrasted with the Past Indefinite "accrued."

355. Epigram: lit. an inscription (a Greek word, *epigramma*), the name given by the Greeks to a short piece of verse inscribed on a public monument. Brevity is still one of the distinguishing marks of epigram. But the word has been made to denote any kind of pointed saying, and especially one in which the words appear to be contrasted, or at least to contain some kind of incongruity. It is therefore based upon the perception of difference, and is closely allied to Antithesis.

"The epigram is an apparent contradiction in language, which, by causing a temporary shock, rouses our attention to some important meaning underneath" (Bain).

The *child* is *father* to the man.—*Proverb.*
By *merit* raised to that *bad* eminence.—MILTON.
Language is the art of *concealing* thought.—ROCHEFOUCAULD.
Natural beauty, when *unadorned*, is *adorned* the most.—THOMSON.
Conspicuous by its *absence.*—DISRAELI.
In the midst of *life* we are in *death.*—*Proverb.*
He lived a life of *active idleness.*
'Tis all thy *business*, *business* how to shun.—POPE.
Art lies in concealing *art.*—*Latin Proverb.*
Fame is the spur that the clear spirit doth raise
(That last *infirmity* of *noble* minds)
To scorn delights and live laborious days.—MILTON.
Ambition first sprung from your blest abodes,
The *glorious fault* of angels and of gods.—POPE.
He who lives *without folly* is not so *wise* as he imagines.—*Proverb.*
Affected *simplicity* is refined *artfulness.*—*Proverb.*
A *workless workman* (a man seeking for work and not finding it).
To *damn* with faint *praise.*
Indecision is sometimes a *decisive* kind of action.—*Review of Reviews.*
Another such *victory*, and we are *undone.*—*Saying of Pyrrhus.*
Beware the *fury* of a *patient* man.—DRYDEN.

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HISTORICAL ENGLISH

AND

DERIVATION

BY

J. C. NESFIELD, M.A.

London
MACMILLAN AND CO., LIMITED
NEW YORK: THE MACMILLAN COMPANY
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ceptionally valuable. There is an excellent 'Note on Vocalic Sounds' contributed by Professor Skeat. Altogether, we have formed a high opinion of Mr. Nesfield's concise historical treatment of the English language."

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G. R. CARPENTER

PROFESSOR OF RHETORIC AND ENGLISH COMPOSITION IN COLUMBIA UNIVERSITY

New York

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[Specimen Page of First High School Course]

and may be at any moment withdrawn by him, a kind of equality may exist among all the subjects of the despot." [Periodic.]

EXERCISE 33

In the passage quoted on pages 124-126, which sentences are loose and which periodic?

81. How to make a Loose Sentence Periodic.—The following examples will show how simple a matter it usually is to make a loose sentence periodic:—

LOOSE	PERIODIC
He had an unusually happy life, in spite of some grievous disappointments and bereavements.	In spite of some grievous disappointments and bereavements, he had an unusually happy life.
He had taught himself how to be idle elegantly, but he had never planned how to earn his own living.	Though he had taught himself how to be idle elegantly, he had never planned how to earn his own living.
I closed the door behind me softly and sped swiftly down the street.	Closing the door behind me softly, I sped swiftly down the street.
Still he pressed forward, waving his sword and cheering his soldiers to the attack, but a third shot lodged deep within his breast.	As he still pressed forward, waving his sword and cheering his soldiers to the attack, a third shot lodged deep within his breast.
Abandon your plan or comply with my wishes.	Either abandon your plan or comply with my wishes.
The soldier was brave and he was discreet.	The soldier was not only brave but discreet.

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IN COLUMBIA COLLEGE

FIFTH EDITION

New York
THE MACMILLAN COMPANY
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EXTRACT FROM PREFACE

Two years ago I published a little book under the title of "Exercises in Rhetoric and English Composition," with the idea of presenting in a compact form (1) such theoretical matter as it seemed to me necessary for the young student of Rhetoric to have thoroughly in mind, and (2) material for practice of all sorts in applying the principles laid down in the text. That book, which was somewhat too elementary for college use, I have now

enlarged and made more advanced in character, until it represents, to my mind, a body of instruction in Rhetoric suitable for the first semester or the first two terms of the Freshman year. If any other teacher should chance to make use of my work, he will perhaps be helped by noticing several peculiarities which it shows. First, I have said very little about "style." What a Freshman needs most of all is to write correctly, clearly, and with some vigour. Attempts to lay stress on individuality of style or on the element of beauty in the pupil's writing should, I think, be deferred until later in the course. Second, I have treated Rhetoric as an art, not as a science. The other point of view is natural and reasonable, but, it seems to me, appropriate only for more advanced students than those for whom I intend this book. Third, I have attempted to broaden the pupil's interest in the art of expression by making an occasional use of Latin, French, and German illustrations. Fourth, I have endeavoured throughout, not to expound the various principles on which I think the art of Rhetoric rests, but to propose a series of questions and problems which the instructor and his pupils may together discuss and solve.

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intending to purchase to allow us the privilege of trying on a pair; *to see* and feel this Shoe upon the foot, *is* to make a customer for *us*. [Unnecessary changes of construction.]

(*d*) *Henry Smith*, attorney for the Merrimac valley navigation company, *stated* in behalf of that company the objections to the proposed buoy, and *the construction* of a fender pier *was* strenuously *advocated by him*. [Unnecessary change of subject.]

EXERCISE IX.

I. Notice, in the following extract from the preface to Arnold's "Essays in Criticism," the arrangement of words, phrases, and clauses by which emphasis is secured:

"And yet, after all, I cannot but think that the *Saturday Review* has here, for once, fallen a victim to an idea,—a beautiful but deluding idea,—and that the British nation has not yet, so entirely as the reviewer seems to imagine, found the last word of its philosophy. No, we are all seekers still! Seekers often make mistakes, and I wish mine to redound to my own discredit only, and not to touch Oxford. Beautiful city! so venerable, so lovely, so unravaged by the fierce intellectual life of our century, so serene!

"'There are our young barbarians, all at play!'

"And yet, steeped in sentiment as she lies, spreading her gardens to the moonlight, and whispering from her towers the last enchantments of the Middle Age, who will deny that Oxford, by her ineffable charm, keeps ever calling us nearer to the true goal of all of us, to the ideal, to perfection,—to beauty, in a word, which is only truth seen from

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BY

EDWIN HERBERT LEWIS, PH.D.

ASSOCIATE PROFESSOR OF ENGLISH IN LEWIS INSTITUTE AND IN THE UNIVERSITY OF CHICAGO.

London

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PRESS OPINIONS.

Spectator.—"We especially welcome this little handbook. . . . The author's remarks on punctuation strike us as being particularly sound. . . . Punctuation is, as the author points out, merely a system of signalling, necessary as much for smoothness as for anything, and should not degenerate into a practice at once violent and exasperating. This little book has been the easier to read for the many delightful passages which are scattered through it from the best prose writers. If rules and technicalities are to be taught, it is as well that they should be illustrated in a manner that is pleasant and memorable."

Guardian.—"His method of instruction is analytical rather than dogmatic; his reasoning is logical and his conclusions generally sound; his rules are practical and his examples interesting. . . . The book is suggestive, brightly written, exceedingly well got up, and should be constantly in the hand of every teacher of literature and composition."

Educational News.—"The book is full of usefully suggestive matter, and will be found helpful to both teacher and student. The chapters on punctuation, on well-knit sentences, and on mastery of a writing vocabulary, are especially noteworthy. Numerous exercises and examples are given throughout. We have pleasure in recommending it as the best junior text-book on the principles of composition that has come under our notice."

Scotsman.—"The book is a thoroughly practical school book, and the instruction it conveys will not only enable those who profit by it to avoid the ordinary pitfalls of the English language, but will also help them in writing correctly, vigorously, and clearly."

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LESSON II

A—WORD-BUILDING

-ar/ (short a)	
*b*ar/	*t*ar/
*c*ar/	[1]*sc*ar/
*f*ar/	*sp*ar/
*j*ar/	*st*ar/

-ā-re (long a)	
*b*āre	*r*āre
*c*āre	[8]*sc*āre
[2]*d*āre	[7]*sh*āre
[6]*f*āre	[4]*sp*āre
*m*āre	[5]*st*āre
[3]*p*āre	*squ*āre

B—TRANSCRIPTION based upon A

1. Father brought a **bar** of steel and a **jar** of **tar** upon the **car**.
2. The stone left a deep **scar** on Sam's forehead.
3. The little **stars** are **far, far** away from our earth.
4. I do not **care** to run about **bare**-footed and **bare**-headed.
5. The noise of the cannon will **scare** the young **mare**.
6. We use set **squares** in our drawing lessons.

C—ELLIPSIS

Supply the missing word from **A**

1. The [1]qu— man always [2]sn—s at our cheers.
2. We all like to live with [3]ch— people.
3. The little squirrel [4]p—s through the trees.
4. The red-deer got quite [5]cl— of the hunters.
5. The farmers [6]sh— their sheep in warm weather.
6. Near the end of the [7]y— comes Christmas.
7. We soon [8]w— of dull and [9]dr— November.

D—BUILDING AND BINDING

1. in leap year February extra day.
2. poor washerwoman weary hard day's work.
3. fear boys steer boat on rocks.
4. beer made malt and hops.
5. spear struck soldier near heart.
6. fear we cannot hear scholars' cheers.

In leap **year** February has an extra day.
The poor washerwoman is **weary** after her day's work.
I **fear** the boys will **steer** the boat on the rocks.

E—ADDITIONAL WORDS built upon A for Composition and Transcription

-eer		-ear	
cheer*less*	dear*est*	wear*ied*	hear*er*
sneer*ing*	fear*ful.*	year*ly*	clear*er*
steer*ing*	*ap*pear*ed*	rear*ed*	wear*ily*
queer*est*	ear-*ring*	hear*ing*	wear*iness*

A—WORD-BUILDING RULES

IV.—*Dropping final* l *in adding* -full, all, -fill, well

al.

al.most
al.together
al.ready
al.though
al.mighty
al.ways
al.so

ful.

wil*ful*.
wil*ful*.ly
[1]care*ful*.
care*ful*.ly
[11]skil*ful*
use*ful*.
aw*ful*.
[12]piti*ful*.
[2]dread*ful*.
fruit*ful*.
[6]thought*ful*.
[9]bag*ful*.
[10]b*ul*.rushes
[4]peace*ful*.
beauti*ful*.
plenti*ful*.
[5]merci*ful*.
fright*ful*.
[3]pain*ful*.
[8]faith*ful*.
faith*ful*.ly
ful.fil.
ful.filled
pocket*ful*.
ful.ly
ful.ness
d*ul*.ness

el.

el.bow
w*el*.fare
[7]w*el*.come

il.

unt*il*.
st*il*.ly
h*il*.ly
ch*il*.blains
dr*ol*.ly

B—TRANSCRIPTION based upon A

1. **Although** Sam is the tallest of the three he is the weakest.
2. I **almost** caught the ball with one hand.
3. John **always** calls for me on the road to school.
4. "Are you all right?" cried the driver.
5. We were left all **alone** in the room **until** dusk.
6. Tom **fulfilled** his promise **faithfully**.
7. We were made very **welcome** by the **beautiful** lady.
8. Be **careful** to **welcome** your old friends.
9. The **thoughtful** boy brought a **plentiful** supply of food.
10. Mary's **chilblains** were very **painful**.
11. The **hilly** country looks very **beautiful**.

C—ELLIPSIS—Seeking and Finding

Supply the missing word from **A**

1. On my master's recommendation I obtained the [1]sit—.
2. My brother died of [2]inflamm— of the lungs.
3. We had permission to carry provisions on the [3]excur—.
4. Great [4]con— followed the explosion at the foundry.
5. We had [5]per— to join the procession on this occasion.
6. There is good accommodation for visitors to the [6]exhib—.
7. After the rebellion there was a restor— of property.
8. He had no permission to take [8]possess— of the house.
9. The missionary gave a [9]descrip— of his [10]recep— by the Indians.
10. In the Artic [11]reg—s the cold is intense.

D—BUILDING AND BINDING

Fit these words together to make sense

1. profession of doctor needs careful preparation
2. no one gained admission except my companion
3. excursionists at railway stations found confusion
4. destruction of city caused sensation
5. dog's affection for master
6. collection made for restoration of old church

The **profession** of a doctor needs careful **preparation.**
No one gained **admission** to the **exhibition** except my **companion.**
The **excursionists** at the **station** found all in **confusion.**

E—ADDITIONAL WORDS—Noun-makers in -tion. *First miss out the* e *and then add the following to*

-ion		-ation		-ition
I	II	III	IV	V
relate′	accom′modate	starve′	ci′vilise	propose′
reg′ulate	commu′nicate	perspire′	col′onise	impose′
dictate′	mod′erate	restore′	or′ganise	compose′
im′itate	des′perate	explore′	accuse′	transpose′
ag′gravate	de′corate	recite′	imag′ine	oppose′
complete′	ed′ucate	examine′	prepare′	compete′

ORAL EXERCISE—*Make Sentences containing each new word, as,*

Here is good **accommodation** for travellers.
Communication with India by **telegraph** is now open.

Exercise III.

Re-write correctly the following, using Capitals and Stops where needed :—

1. charles dickens lord macaulay sir walter scott and robert burns were great writers. The most interesting magazines are —.
2. Some favourite poems are john gilpin the wreck of the hesperus we are seven the may queen and the skylark
3. in our school library are westward ho robinson crusoe the pilgrim's progress by john bunyan esop's fables and uncle tom's cabin. My favourite pictures are — .
4. the times the standard the chronicle the daily graphic and the daily telegraph are well-known london papers
5. the germans dutch and spaniards are european nations
6. the hindoos chinese and turks are asiatic peoples
7. edward the III. king of england and his son the black prince led the english army at crecy in france
8. I have read and like best these books —.
9. My favourite writers are —. My favourite poems are — .
10. My favourite poets are —. My historical favourites are —

Exercise IV.—Building and Binding.

Make sentences using correctly the following words :—

the english	a shetland pony	the dutch
scotch wool	irish butter	an englishman
a frenchman	a bengal tiger	an arabian horse
an indian chief	a spanish officer	the welsh

Exercise V.—Building and Binding.

Introduce the following into sentences :—

Sunday	November	Christmas	February	Easter
Monday	Wednesday	Friday	August	October
May-day	Ascension day	January	Saturday	Tuesday
July	Whit-Sunday	April	December	March

Exercise VI.—Building and Binding.

Make sentences containing the following historical names :—

Gunpowder Plot	The Battle of Trafalgar
The Resurrection	The Death of Nelson
Crossing the Red Sea	The Crucifixion
The Civil War	The Flood
The Norman Conquest	The Crusades
The Indian Mutiny	The Discovery of America

ILLUSTRATIVE EXAMPLE OF AUTOBIOGRAPHICAL METHOD.

Objects or Substance to be examined and Questioned upon, and Oral Answers given by the Pupils in three Stages before writing out.

First, place a familiar object, or a picture of it, before the class, such as "Blowing Bubbles," an Umbrella, a Kite, a Chair, a Doll, or a Top; or, let **one child** personate the **object** and answer, in complete sentences, **some** of the following oral questions put to it by a **second scholar**, who stands up before the class and acts as **questioner** or cross-examiner. Ask **other children** to supply any suitable question omitted which they think suitable for eliciting a fitting reply.

In this way enthusiasm, attention, and intelligence, will be aroused and sustained even in the lower classes, where the plan may be introduced with advantage in securing answers in **complete statements.**

STEP I.—Oral Questions on the following:

(a) An Umbrella. (b) Father's Pipe.
(c) A Soap Bubble.

1. What are you?
2. How did you get your name?
3. Who uses you?
4. What were you once?
5. What were you like then?
6. Where were you obtained or found?
7. Of what stuff or materials are you made?
8. From what sources do you come?
9. What are your parts?
10. Are you made, grown, or fitted together?
11. How were you fitted together, or prepared for use?
12. Who made you? Where?
13. What is your appearance now? What is your size, shape, or colour? Qualities or nature?
14. How are you used? By whom are you needed? When are you needed? For what purpose are you used?
15. Where are you kept? How are you treated by others?
16. Are you the only kind?
17. What value or advantage to others are you in the world?
18. What is known of your life, experience, and adventures of interest to these scholars?

STEP II.—Oral Answers to some of the Questions.

1. I am an umbrella, and am used by many people, young and old.
2. I get my name from a word which means a shade.
3. My parts are a frame and a cover. My frame consists of a stick, about a yard long, wires, and a sliding metal band. At the lower end of the stick is a steel ferrule or ring. This keeps the end from wearing away when I am used in walking.

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It is a real aid to a young composer to have a right standard of correctness ever before his mind to which to silently appeal when improving or finally revising his exercises. He is thus able to understand not only **where,** but **how** and **why** he has violated some vital rule in writing clearly and pleasantly. Thus many errors due to haste and carelessness are reduced, and much labour saved the teacher. (See Chapter, "Errors in English.")

When criticising, polishing up, commenting upon, and comparing good and bad essays, narratives, or biographies previously written in class or at home, you should ask yourself such questions as the following, and try to give sensible and satisfactory answers, and also reasons for them, *e.g.* varying the form, position, and length of clause, etc. :—

1. **Is this the best arrangement of the words? Does it look right?**
2. **Does it sound right, like book English, when read aloud?**
3. **Where lies the fault? What does it spring from?** (See Scheme and large Charts.)
4. **What rule is violated in the 1st, 2nd, 3rd sentences, etc.** (See Danger Signal Scheme and Exercises, pages 88-91.)
5. **How can I improve it—by (1) adding, (2) subtracting, or (3) substituting a word or a phrase—which?**
6. **Why does the new form, when read aloud, satisfy me?**
7. **How could I express it more neatly and forcibly in yet another form?** *Read it aloud and rearrange the explanatory words.*
8. **How could I say it in fewer, better, or more expressive words?** (Synonyms.) *E.g.* By expressing a phrase or a clause in one word.
9. **Why does Tom Brown's paper give more pleasure than others?**
10. **Which of his sentences show better structure? Why is this?**

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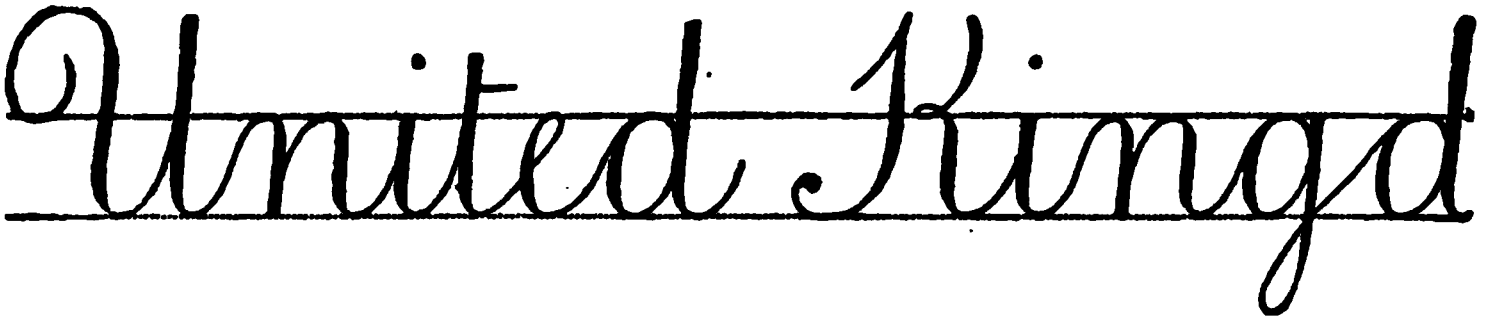

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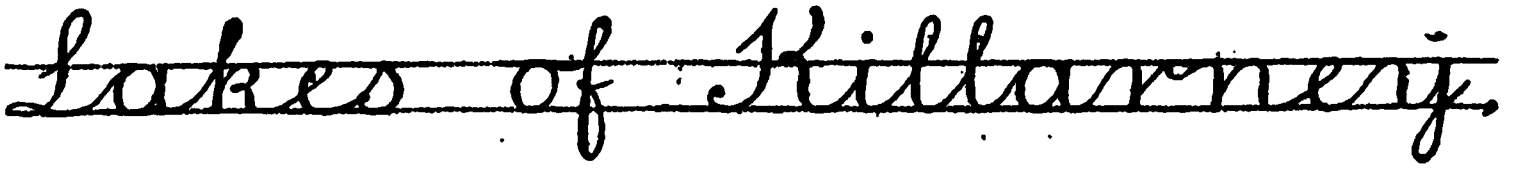

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[SPECIMEN PAGE]

... bien... ne prenez pas un air aussi sérieux... bien... parfait. Ah! mais il ne faut pas froncer les sourcils.

Bébé (*yawns*). Est-ce fini?

Le Photographe (*impatient*). Nous n'avons pas encore commencé.

Le Grand'maman. Voyons, Bébé, faites donc tout ce que Monsieur le photographe vous dit.

Bébé (*very cross*). Je fais tout ce qu'on me dit. Mais je ne sais plus si je dois ouvrir ou fermer la bouche.

Le Photographe. Allons, Monsieur, souriez... encore un peu... bien... pas tant... Ne clignotez pas... bien...

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SCENES OF FAMILIAR LIFE

SCÈNE I

AU PREMIER DÉJEUNER

MONSIEUR GROUVEL, (*old gentleman* in dressing-gown, a silk handkerchief round his head).
MADAME PUISEUX, (*his housekeeper* in cap and apron)

MONSIEUR GROUVEL. Sept heures vont sonner, et le café n'est pas sur la table ; c'est trop fort.

(*He rings.*)

MADAME PUISEUX. Monsieur a sonné ?

MONSIEUR GROUVEL. Mai oui, où est le café ?

MADAME PUISEUX. Je l'apporte à l'instant ; il n'est pas encore sept heures.

MONSIEUR GROUVEL. Voyons, dépêchez-vous, s'il vous plait.

MADAME PUISEUX. J'allais l'apporter quand monsieur a sonné et m'a empêchée de monter le déjeuner.

MONSIEUR GROUVEL. C'est bien. Donnez moi mon journal, s'il vous plait.

MADAME PUISEUX. Le voici, monsieur (*hands him the newspaper and goes out*).

MONSIEUR GROUVEL (*alone*). Ma gouvernante devient inexacte et raisonneuse. Hm ! Hm ! Deux grandes imperfections. Je ne puis pas supporter le manque de ponctualité ; quant aux caquetages, j'en ai horreur ! (*The clock strikes seven ; on the seventh stroke Madame Puiseux arrives with a tray.*)

MADAME PUISEUX. Voilà, monsieur, le café est prêt. Monsieur mangera-t-il un œuf ce matin ?

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HATEZ-VOUS LENTEMENT

SCÈNE I

M. Legrand (*va et vient dans le salon, dérange les meubles, en ayant l'air de chercher quelquechose; il appelle*) Virginie! (*il regarde la pendule puis le cartel*) Virginie! (*il regarde sa montre*) Virginie!

Mme. Legrand (*arrive très lentement et parle avec une lenteur affectée*). Qu'y a-t-il? On dirait que le feu est à la maison. Tu cries comme un aigle, tu m'écorches les oreilles avec ton Virginie! Virginie!

M. Legrand (*qui pendant ce discours a de nouveau consulté la pendule et sa montre, en essayant d'interrompre sa femme*). Je suis excessivement pressé, Virginie, tu sais bien qu'aujourd'hui il y a séance à la société d'entomologie.

Mme. Legrand. Aujourd'hui c'est la société d'entomologie, demain c'est la société de conchyologie, après-demain c'est la société d'une autre "*logie.*" Que sais-je? Mais vois-tu, Anatole! avec toutes tes "*logies*" tu te rends insupportable dans ton propre *logis*. Et moi j'en ai par-dessus la tête.

M. Legrand (*à part, pendant que Mme. Legrand s'installe dans un fauteuil en déployant un journal*). La voilà partie—impossible d'arrêter ce moulin à paroles! Elle a des qualités, ma femme, je l'avoue, mais elle ne peut pas comprendre qu'on soit pressé—elle ne se rend pas compte qu'une minute et une minute font deux minutes;—c'est comme un sens qui lui manque! (*Il tire sa montre.*) Mais je cherchais quelquechose? (*Se frappant le front*) Ah oui! c'est mon chapeau. (*Il regarde sous les meubles.*)

Mme. Legrand (*relevant sa robe*). Aurais-tu par hasard encore laissé échapper une de tes araignées? Que cherches-tu?

M. Legrand. Je ne peux trouver mon chapeau, et il faut absolument que je parte pour assister à la séance.

Mme. Legrand. Ton chapeau—malheureux! mais il est sur ta tête.

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Natural and rational method.

To acquire a language, you must hear it spoken, not in its poetical form, but in the simple expressions of every-day life, and it is only by hearing these expressions often enough that you can become sufficiently familiar with them to employ them with ease and fluency in your conversation. In a word, you must assimilate them, not learn them. "*Les plus sûr moyen d'apprendre une langue, c'est de la vivre.*"

In the lessons we put before you, you will find that the most common events of our daily life are placed first. These are the things about which you must be able to express your thoughts and feelings; they form the topics of every-day conversation. You may often want to say that you are hungry, but you may never be called upon to write the description of a sunset.

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Our exercises represent simple scenes taken from every-day life, and each exercise consists of a series of complete sentences related one to the other. Each sentence describes one part of the scene, but not at random: all the sentences are connected; each one is the natural consequence of the preceding one, so that the lesson becomes a lesson not of *words* but of *things*, and of things in their natural order. The actions are the most familiar; and instead of it being a task to remember the order, it is difficult to forget it. Let us illustrate. We venture to give in English a lesson out of the Elementary Course:

I START FOR SCHOOL.

I put on my overcoat, hat, and gloves;
I take my books;
I also take my exercise books and my pencil-box;
I put them in my satchel.

Then I take my satchel
I sling it over my shoulder,
and I go out of the house.

I go towards the school;
I walk quickly,
and I soon arrive at the school.

You will notice that there is nothing haphazard in the selection of sentences and words. All the ordinary expressions connected with the idea under consideration, viz., "My starting for school," are given. We have taught in this lesson all the simplest forms of the language connected with that one act of the child's life.

Try to make your pupils imagine the scene, and for this purpose describe it fully in English.

As soon as you have succeeded in giving them a clear mental picture of the scene, repeat the verbs of the first paragraph in *English*, and you will see by the look of intelligence on the faces of your pupils that the simple enunciation of the actions has enabled them to recall the whole scene. Now proceed to give the verbs in *French*—say each one several times, speaking slowly and distinctly, and insist upon the pupils connecting the new sound with the actions they have in mind, and not with the English word.

Having thus gone through the verbs, and given any explanation which you deem necessary, repeat each verb

Repetition.

again several times without any comment: finally repeat the verbs once. As regards the number of repetitions the teacher must be guided by his pupils' faces. Bright eyes, eager faces, will show that the pupil is ready to try what he can do. Puckered brows show, as plainly as possible, that the pupil does not see clearly what is required of him. At first, be content to go slowly, and above all be patient. Durable buildings must rest on firm foundations.

Now let the pupils repeat, each one taking a verb. At once the great value of this principle of Association of ideas, about which we have already spoken, will become apparent, for the pupils will be able to recall the actions in their proper order.

We find it an excellent plan to adopt simultaneous repetition during these initial stages. It does away with that shyness and confusion often experienced by pupils when they hear their own voices uttering strange sounds; in addition to this, it makes every pupil work.

When the verbs are assimilated, the teacher should write them on the black board, and have them read through; then the black board should be reversed whilst the teacher, taking each verb separately, groups the words of the sentence around it. The *verb*, the action, is the important part of the sentence. An action demands some one to perform it, and usually requires a complement. So take the first verb, "*mets.*" Describe the subject. Who puts? "*Je* mets." Describe the garment. "Je mets" what? "Je mets *mon pardessus*,' etc. Each word—verb, noun, adjective—is to be fully

described, so that every one may be connected with a mental picture of the object or idea, and not with the written word. Deal with the sentences in the same manner and in the same order as you dealt with the verbs, and let all needful explanations be given with the first repetitions.

The final repetition given by the teacher should be unaccompanied by any comments, and thus the pupils should be left free to concentrate their attention entirely upon the foreign sounds. As in the case of the verbs, the pupils must now be required to say the sentences through, and afterwards to read them from the board.

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We would advise teachers to make each lesson of Book VIII. the subject of French conversation in class, bringing out and explaining the different points of the lesson, and encouraging the pupils to discuss these points, draw their own conclusions, and give their opinions in their own words. This having been done, the pupils should be requested to read the text and compare their way of expressing their ideas with that of the author. The lesson should afterwards become the subject of an essay. At the end of each exercise we

have prepared sentences which only require to be completed, thus showing the pupil how, and in what order, he should express his thoughts.

A glance at the subjoined list will give an idea of the subjects treated in the following pages:—

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DIX-NEUVIÈME LEÇON.

Les parties du corps

1. Je **prends** un crayon ;
2. je **dessine** un bonhomme ;
3. je **dessine** les trois parties de son **corps** :
   la tête, le tronc, les membres.

VINGTIÈME LEÇON.

La tête.

1. Je **dessine** la tête ;
2. je **dessine** le front ;
3. je **dessine** les cheveux ;
4. je **dessine** les deux yeux ;
5. je **dessine** les deux oreilles ;
6. je **dessine** les deux joues ;
7. je **dessine** le nez ;
8. je **dessine** la bouche ;
9. je **dessine** le menton ;
10. je **dessine** le cou.

CONVERSATION.

Révision de la leçon précédente.

1st P. Sais-tu pourquoi X. . . . a été retenu ce soir?

2nd P. Je crois qu'il n'a pas su sa leçon.

1st P. Cela lui arrive souvent d'être puni.

2nd P. Ce n'est pas étonnant; c'est un paresseux.

1st P. Le maître est sévère pour lui.

2nd P. Non, il n'est que juste.

QUINZIÈME LEÇON.

LA CUISINE.

Scene.—The cook gets the stove ready, prepares the dinner, sends it up to the dining-room.

1. La cuisinière **allume** son fourneau;
2. elle **prépare** la viande;
3. elle **épluche** les légumes;
4. elle **prépare** l'entremets (pudding, crême, etc.)
5. La cuisinière **fait rôtir** la viande au four;
6. elle **met** les légumes sur le feu;
7. elle **fait cuire** l'entremets.
8. Quand le dîner **est** cuit,
9. la cuisinière **place** les mets sur des plats,
10. et les **tient** prêts pour le service de la table.

Entretien au cours de la leçon.

M. N'hésitez pas, cette fois.

. . . . . .

M. Vous n'avez fait que deux fautes.

P. Oh ! je vois où je me suis trompé.

M. Ce n'est pas une grosse affaire.

LEÇONS PRÉLIMINAIRES.

I. LA LEÇON DE GRAMMAIRE.

Scene.—A class-room. The master explains to his pupils the three great divisions of time : present, past, and future.

§ I.

1. Le maître donne une leçon de grammaire ;
2. Écoutons-le.

3. Il parle du temps dans les verbes ;
4. il dit :
5. Nous **avons commencé** une leçon hier ;
6. **continuons**-la aujourd'hui ;
7. nous l'**achèverons** peut-être demain.

8. Car toute action a trois phases :
9. commencer—continuer—achever,
10. qui correspondent à trois temps :
11. le passé—le présent—le futur.

§ II.

12. **Hier**, c'est le PASSÉ,
13. qui ne nous appartient plus.
14. **Aujourd'hui**, c'est le PRÉSENT,
15. qui se dérobe sous nos pieds
16. et s'éloigne de nous sans retour.
17. Profitons-en ;
18. car nous ne savons pas
19. si **demain**, qui est l'avenir,—le FUTUR—
20. nous appartiendra.

To be learnt by heart.

Le Temps a trois doigts dans sa main :
Aujourd'hui, le présent qui passe ;
Hier, le passé qui s'efface ;
Demain, l'avenir incertain.

DIX-NEUVIÈME LEÇON. [CONVERSATION.]

L'HEURE QU'IL EST.

MASTER. X. . . ., regardez la pendule; quelle heure est-il?
1ST PUPIL. Je ne sais pas dire l'heure, Monsieur.
M. Quelqu'un sait-il dire l'heure en français? . . . Comment! personne ne sait? Z. . . ., vous voyez bien les aiguilles?
2ND P. Oui, Monsieur, je les vois.
M. Sur quel chiffre est la petite aiguille?
2ND P. Elle est sur le chiffre onze.
M. Et la grande aiguille?
1ST P. Elle est sur le chiffre douze.
M. Eh bien, il est onze heures. La pendule va sonner; vous compterez les coups.
PUPILS. Un, deux, trois, quatre, cinq, six, sept, huit, neuf, dix, onze!

Grammatical Questions.

25. *How many kinds of numeral adjectives are there in French?*
Two: the cardinal and the ordinal.

	CARDINAL.			ORDINAL.	
Ex.	1, 'un.'	11, 'onze.'	'premier,'	*first.*
	2, 'deux.'	12, 'douze.'	'deuxième,'	*second.*
	3, 'trois.'	13, 'treize.'	'troisième,'	*third.*
	4, 'quatre.'	14, 'quatorze.'	'quatrième,'	*fourth.*
	5, 'cinq.'	15, 'quinze.'	'cinquième,'	*fifth.*
	6, 'six.'	16, 'seize.'	'sixième,'	*sixth.*
	7, 'sept.'	17, 'dix-sept.'	'septième,'	*seventh.*
	8, 'huit.'	18, 'dix-huit.'	'huitième,'	*eighth.*
	9, 'neuf.'	19, 'dix-neuf.'	'neuvième,'	*ninth.*
	10, 'dix.'	20, 'vingt.'	'dixième,'	*tenth.*

In French, cardinal numbers are used in mentioning dates and names of sovereigns.

Ex. 'le premier mai,' *May the 1st.* 'Charles premier,' *Charles I.*
'le cinq mai,' *May the 5th.* 'Charles sept,' *Charles VII.*

Written Exercise.

Write in French: *Will you kindly tell me the time? Certainly; it is five minutes to twelve; you will soon hear the clock strike.*
Write in full: *On the 3rd of September*, 1896.—*June the 1st.*—*George the Third and Charles I. were kings of England.*

TRENTE-QUATRIÈME LEÇON.

LA CHASSE (LE DÉPART).

Scene.—The huntsman gets ready, shoulders his gun, and goes with his dogs to meet the other sportsmen.

1. Le *chasseur* **est** debout avant l'aube;
2. *il* **met** son costume de chasse;
3. *il* **examine** son fusil avec précaution
4. et le **passe** en bandoulière;
5. *il* **se munit** de sa gibecière et d'une provision de cartouches;
6. *il* **a** soin de ne pas **oublier** son permis de chasse.

7. Le *chasseur* **va ouvrir** le chenil;
8. les *chiens* **aboient** et **bondissent**;
9. leur *maître* leur **passe** une petite chaîne au collier
10. et **va**, avec ses chiens, **rejoindre** d'autres chasseurs.

11. Les *chasseurs* **sont rassemblés**;
12. *ils* **confient** la meute à un piqueur;
13. ce *dernier* **tient** les chiens en laisse.
14. *Tout le monde* **part** en campagne.

Entretien au cours de la leçon.

M. Vous ne paraissez pas très attentif, X. . ., me faudra-t-il vous rappeler à l'ordre?

P. Pardon, Monsieur, j'écoute.

M. Cependant, on dirait que votre esprit bat la campagne.

. . . . . .

M. Allons, vous récitez à qui mieux mieux.

Written Exercise.

Write the first paragraph in the *subjonctif présent*, beginning each sentence with **il faut que . . .**

Find *infinitif*, *participe présent*, and *participe passé* of all the verbs in the lesson.

CINQUIÈME LEÇON.

L'INDUSTRIE.—(1) LA FONDERIE.

Scène.—Le fer : comment on l'obtient, et comment on le prépare. Ses usages.

1. Le fer **est** le plus utile des métaux.
2. On le **trouve** dans la terre à l'état de minerai.
3. Ce minerai **est extrait** de la mine
4. par des ouvriers **appelés** mineurs.

5. On **transporte** le minerai à la fonderie.
6. Là, on le **broie**,
7. et on le **met** dans les hauts-fourneaux.

8. Sous l'action d'un feu intense, le métal **fond**
9. et **se sépare** de sa gangue ;
10. mais, comme il y **reste** des impuretés,
11. on le **fond** de nouveau,
12. jusqu'à ce qu'il **soit épuré**.

13. Ce traitement du minerai de fer **donne** le fer, la fonte et l'acier,
14. suivant la proportion de carbone qui s'y **trouve** incorporée.

15. Le fer et l'acier, ainsi obtenus, **sont passés** au laminoir
16. et **livrés** au commerce en lames ou en barres ;
17. la fonte **est coulée** dans des moules.

Entretien au cours de la leçon.

M. Nous avons une tâche à remplir, essayons de nous en tirer honorablement. Qui ouvrira le feu ? Sera-ce vous, X. . . . ?

1st P. Pardon, Monsieur, Y. . . . est plus avancé que moi ; donc c'est à lui. À tout seigneur tout honneur.

M. Non, je ne l'entends pas de cette oreille. Que chacun récite à son tour.

. . . . . .

M. Encore une ou deux répétitions, et vous saurez cela sur le bout du doigt.

Written Exercise.

Translate the first three paragraphs into English.

Find homonyms of *fer, terre, mine, haut, sous, fond, des, soit, lames, moule.*

Find synonyms of *il se trouve, appelé, met, broie, est extrait, de nouveau.*

TROISIÈME LEÇON.

EN CHEMIN DE FER.

Ordre des idées.—**Le départ du train. La route. Les arrêts. Au buffet. La gare d'arrivée.**

À Dieppe, un train omnibus attend les voyageurs sur le quai de débarquement et les transporte à Paris en quatre heures. On fait le trajet en moins de temps par train express et par train rapide. Nous passons à Rouen, une vieille ville très intéressante qui vit naître les deux Corneille.—"Rouen, 10 minutes d'arrêt, buffet!" crie un employé quand le train entre en gare.

Nous voudrions bien visiter la ville, elle en vaut la peine; mais nous allons directement à Paris où nous appellent nos affaires. Nous entrons cependant au buffet de la gare et nous nous faisons servir, sur le comptoir, une tranche de jambon, un petit pain et un carafon de vin.

Nous n'avons pas fini notre modeste déjeuner que nous entendons le cri: "Voyageurs pour Paris, en voiture, s'il vous plaît!" Nous regagnons à la hâte notre wagon; le train se remet en marche et traverse à toute vitesse les riantes vallées et les gras pâturages de la Normandie.

Il y a dans notre compartiment des personnes qui lisent des journaux ou des romans plutôt que d'admirer les sites ravissants qui s'offrent à la vue; pour ma part, je ne puis me résoudre à les imiter. Mes yeux se fixent sur les campagnes verdoyantes et les jolis villages qui se succèdent jusqu'aux faubourgs de la capitale, annoncés par les innombrables cheminées d'usine dont les hautes silhouettes se dressent à l'horizon.

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FIRST YEAR

BY

A. C. POIRÉ

PRINCIPAL OF THE NORTHERN INSTITUTE OF LANGUAGES
LEEDS AND BRADFORD

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HOW TO STUDY THE EXERCISES

ONE'S purpose in learning a language is fourfold :—

1. To **understand** the spoken language.
2. To **speak** fluently.
3. To **read** easily.
4. To **write** correctly.

To obtain the best results it is desirable to allow the pupils to *see* the spelling *only after* they have heard, understood, and repeated the sounds. Then, *but only then*, should they read, and afterwards write, the exercise.

This is how the work should proceed to give satisfactory results :—

1. Learning

Exercises are divided in steps of five or six sentences each.

1. The teacher reads the first step slowly in *English*.
2. He next states the first sentence in English, and then teaches orally each French word of the sentence, commencing with the basic word (generally the verb).
3. This sentence must be repeated three or four times. Details are necessary to help the student in forming a clear picture—the teacher can help a great deal by gestures.
4. The pupil is then allowed to repeat the sentence.
5. Each sentence of the step should be taught in the same manner.
6. Finally the teacher repeats the whole step at least four times, previously calling out the basic word of each sentence in English, to recall the picture.
7. Now the pupils repeat the whole step, and, should they hesitate, the teacher may help them with a gesture likely to recall the action.

Each step in the exercise to be treated in the same manner.

When the exercise is finished (in about thirty minutes), the teacher repeats the whole exercise once through, and then the students repeat *the whole* exercise of twenty to twenty-five sentences (without having yet seen the spelling).

2. Reading

Now that the exercise has been learnt by the ear and repeated, the students open their books. The teacher reads one sentence and the students repeat from their books; and thus through the exercise, sentence by sentence. Then the teacher reads slowly through *the whole* exercise alone; and lastly the pupils read the whole exercise alone.

3. Writing

The pupils write the exercise at home in a different form of the verb (past, future, etc.) as directed. (Pupils anxious to do good work copy the exercise once, and then, to make sure that they know the exercise by heart, they write it from memory in order to test their spelling.)

Grammar

The rules and examples set for each lesson must be read twice by the teacher in French and the French learnt by the student as home-lesson.

Verbs

Only one tense of the verb should be learnt in one lesson; but it must be learnt thoroughly. Here again, the teacher should teach the pronunciation thoroughly before the students learn the verbs. While learning the verbs, the pupil should always endeavour to have present in his mind (1) the action being performed, (2) the time when the action is performed, (3) the person performing the action. Otherwise it is mere parrot work.

Remarks about Health, the Weather, Meals, etc.

Ten minutes should be devoted (beginning of lesson) to the *oral* teaching of these sentences which must aiso be *written* and learnt by the pupils at home.

THE NOUN

9. The neuter gender does not exist in French. A French noun is either masculine or feminine. (The gender of nouns is to be learnt by the practice of conversation; by the ear, and not by the eye.)

Formation of the Plural

10. *General Rule.*—The plural of nouns is formed by adding **s** to the singular:

the boy	the girl	the pencil	the slate
the boys	the girls	the pencils	the slates

There are numerous exceptions to that general rule; we give the principal ones:—

11. (1) Nouns ending in **s, x, z** remain *unchanged*:

the son	the voice	the nose	the walnut
the sons	the voices	the noses	the walnuts, etc.

12. (2) Nouns ending in **au, eu, œu, ou** take **x**:

the hat	the game	the vow	the cabbage
the hats	the games	the vows	the cabbages

13. (2*a*) The following nouns follow the general rule:

the landeau	the nail	the cuckoo	the cheat	the madman
the halter	the hole	the halfpenny	the bolt	

14. (3) Nouns ending in **al** or **ail** change al or ail into **aux**:

the canal	the horse	the work	the coral, etc.

15. (3*a*) A few nouns ending in **al** or in **ail** follow the general rule and take **s** for the plural:

ball	carnival	jackal	treat
detail	fan	rudder	porch (church)

LE NOM

Le genre neutre n'existe pas en français. Un nom français est ou masculin ou féminin. (Le genre des noms doit être appris par la pratique de la conversation ; par l'oreille et non par les yeux.)

Formation du Pluriel

Règle générale.—On forme le pluriel des noms en ajoutant **s** au singulier :

le garçon	la fille	le crayon	l' ardoise
les garçons	les filles	les crayons	les ardoises

Il y a de nombreuses exceptions à cette règle générale ; nous donnons les principales :—

(1) Les noms se terminant en **s, x, z** restent *invariables* :

le fils	la voix	le nez	la noix
les fils	les voix	les nez	les noix, etc.

(2) Les noms se terminant en **au, eu, œu, ou** prennent **x** :

le chapeau	le jeu	le vœu	le chou
les chapeaux	les jeux	les vœux	les choux

(2 *bis*) Les noms suivants suivent la règle générale :

le landeau	le clou	le coucou	le filou	le fou
les landeaus	les clous	les coucous	les filous	les fous
le licou	le trou	le sou	le verrou	
les licous	les trous	les sous	les verrous	

(3) Les noms se terminant en **al** ou **ail** changent **al** ou ail en **aux** :

le canal	le cheval	le travail	le corail
les canaux	les chevaux	les travaux	les coraux, etc.

(3 *bis*) Quelques noms se terminant en **al** ou en **ail** suivent la règle générale et prennent **s** au pluriel :

un bal	un carnaval	un chacal	un régal
des bals	des carnavals	des chacals	des régals
un détail	un éventail	un gouvernail	un portail
des détails	des éventails	des gouvernails	des portails

74. THE DEMONSTRATIVE PRONOUN

My book and **that** of my brother	My pen and **that** of my sister
My pencils and **those** of my friend	My oranges and **those** of my cousin
Here are two books; take **this one** and give me **that one**	Here are two pens; take **this one** and give me **that one**

INDEFINITE FORM (when no noun is expressed)

Take this and leave that

75. **he is, she is, it is, they are** are expressed in French by **c'est** or **ce sont** before a **noun, pronoun,** or **superlative**:

it is I **it is we** **it is you** **it is they**
he is my brother **they are my sisters**
they are the best children in the school

76. THE RELATIVE PRONOUN

who	I know that man **who** is singing
to whom	You know the child **to whom** I was speaking
from whom	**From whom** have you received all this money?
whom	A lady **whom** you know has come
of whom	The gentleman **of whom** you speak is here
of what	**Of what** were you speaking this morning?
to what	Pray, **what** are you thinking of?
(where) in which	This is the house **in which** I live

77. which (*m.s.*)	The arm-chair in **which** you are
which (*f.s.*)	**Which** of these pens will you have?
which (*m.pl.*)	**Which** of these pencils are the best?
which (*f.pl.*)	**Which** of these pens are the best?

78. The words **le, la, les** of the above pronouns are of course subject to the same modifications as the article, and become **du, de la, des** or **au, à la, aux,** according to the sense.

LE PRONOM DÉMONSTRATIF

Mon livre et **celui** de mon frère	Ma plume et **celle** de ma sœur
Mes crayons et **ceux** de mon ami	Mes oranges et **celles** de ma cousine
Voici deux livres ; prenez **celui-ci** et donnez-moi **celui-là**	Voici deux plumes ; prenez **celle-ci** et donnez-moi **celle-là**

FORME INDÉFINIE (aucun nom exprimé)

Prenez **ceci** et laissez **cela**

he is, she is, it is, they are sont exprimés par **c'est** ou **ce sont** devant un **nom**, un **pronom**, un **superlatif**.

c'est moi — **c'est** nous — **c'est** vous — **ce sont** eux
c'est mon frère — **ce sont** mes sœurs
ce sont les meilleurs enfants **de** l'école

LE PRONOM RELATIF

qui	Je connais cet homme **qui** chante
à qui	Vous connaissez l'enfant **à qui** je parlais
de qui	**De qui** avez-vous reçu tout cet argent ?
que	Une dame **que** vous connaissez est venue
dont	Le monsieur **dont** vous parlez est ici
de quoi	**De quoi** parliez-vous ce matin ?
à quoi	**A quoi** pensez-vous donc !
où	Voici la maison **où** je demeure
lequel	Le fauteuil dans **lequel** vous êtes
laquelle	**Laquelle** de ces plumes voulez-vous ?
lesquels	**Lesquels** de ces crayons sont les meilleurs ?
lesquelles	**Lesquelles** de ces plumes sont les meilleures ?

Les mots **le, la, les** des pronoms précédents sont naturellement soumis aux mêmes modifications que l'article, et deviennent **du, de la, des** ou **au, à la, aux**, selon le sens.

Lesson 21. Bicyclette. 1. Le Départ.

1. Le cycliste **sort** sa bicyclette de la remise ;
2. il **huile** sa bicyclette avec une burette ;
3 il **gonfle** les caoutchoucs pneumatiques ;
4. il **s'assure** que tout **est bien en ordre** ;
5. il **vérifie** les écrous avec la vis de serrage.

6. Il prend les deux **poignées** du guidon ;
7. il met le **pied gauche** sur le marchepied ;
8. il **s'élance** (prend un élan) du pied droit ;
9. il **saute** (se met) légèrement **en selle** ;
10. il **pose** les pieds sur les pédales.

11. Le vélocipédiste **pédale** vigoureusement ;
12. les pédales **font mouvoir** le pignon ;
13. le pignon met **la chaîne** en mouvement ;
14. la chaîne **fait mouvoir la roue d'arrière** ;
15. la bicyclette **roule** rapidement **sur la chaussée**.

16. Dans les **rues encombrées**, le cycliste va lentement ;
17. il **dévie à** chaque instant de la ligne droite
18. pour **éviter** piétons, voitures, tramways, etc.
19. Fréquemment il **fait sonner** son timbre
20. pour **avertir** les passants de **son approche**.
21. (**En Angleterre** on se dérange **à gauche** ;
22. **en France**, on se dérange **à droite**).

Home Work.—Revise verbs 114 to 117.—Write the above exercise : Demain, **nous sortirons**..., etc.—Learn rules 98 to 102.—Revise exercises 10 to 15.—Phonétique : 13, 14.

---

1. Je me porte à merveille ?—Moi pas...
2. Quelle date avons-nous aujourd'hui ?...
3. Pouvez-vous me dire l'heure ?...
4. Vous êtes-vous promené aujourd'hui ?...
5. Est-ce qu'il fait clair de lune ce soir ?—Oui...

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30th Lesson. Trentième Leçon.

RULE 16.—*If a Noun is taken in a* **partitive sense**, *that is, if a certain* **part, quantity, number,** *or* **fraction** *of a whole is to be expressed,* **du, de la, de l', des** *must be used* :—

			Singular.	
m.	le papier,	*the paper.*	du papier,	*some (any) paper ; paper.**
	l'argent,	*the money.*	de l'argent,	*some (any) money ; money, silver.**
f.	la toile,	*the cloth.*	de la toile,	*some (any) cloth ; cloth.**
	l'huile,	*the oil.*	de l'huile,	*some (any) oil ; oil.**
			Plural.	
m.	les ciseaux,	*the scissors.*	des ciseaux,	*some (any) scissors ; scissors.*
	les abricots,	*the apricots.*	des abricots,	*some (any) apricots; apricots.*
f.	les prunes,	*the plums.*	des prunes,	*some (any) plums ; plums.*
	les oranges,	*the oranges.*	des oranges,	*some (any) oranges ; oranges.*

* CAUTION.—In English, *some* and *any* are in many cases not expressed ; but in French the *Partitive Article* is strictly required before a Noun used in a Partitive sense :—

What is this—wine *or* water?	Qu'est-ce que c'est—du vin ou de l'eau?
We have friends.	Nous avons des amis.

le vinaigre	*the vinegar.*	la pomme de terre	*potato.*
le poivre	*the pepper.*	la nouvelle	*the news.*
la moutarde	*the mustard.*	le timbre-poste	*the postage-stamp.*
la salade	*the salad.*	l'Américain	*the American.*
le glacier	*the glacier.*	le Russe	*the Russian.*
l'ardoise (*f.*)	*the slate.*	ou (conj.) *or.*	où (adv.) *where.*

A. 1. Avez-vous du vinaigre, de l'huile, du poivre, et du sel ?—Oui, et nous avons aussi de la moutarde. 2. La Suisse est-elle un pays intéressant ?—Oui, il y a des montagnes, des lacs, des cascades, et des glaciers. 3. Dans les montagnes du pays de Galles il y a du plomb, de l'étain, et des ardoises. 4. Nous aurions mangé du jambon et de la salade. 5. Nous avons reçu des nouvelles du théâtre de la guerre. 6. Voici du papier, de l'encre, des crayons, et des plumes. 7. Voilà des timbres-poste.

B. 1. Shall we have coffee or tea ?—Tea and sugar. 2. Had you any bread ?—Yes, bread and butter. 3. If we had money, we should have some wine, for we are thirsty. 4. If you were hungry, should you not have bread and meat ? 5. Has the waiter brought any beer ?—Yes, and he has also brought some water for you. 6. Are there any Englishmen in Paris ?—Yes, and there are also Russians and Americans. 7. Here is butter.

17. Present Perfect (Passé Indéfini) of avoir and être.

le voyageur	*the traveller.*	le perroquet	*the parrot.*
la nouvelle	*the news, tidings.*	la maisonnette	*the cottage.*
la médaille	*the medal.*	le nain	*the dwarf.*
la personne	*the person.*	l'os (*m.*)	*the bone.*
personne . . . ne	*no one ; nobody ; not anybody.*	le mouton	*the sheep, mutton.*
		souvent	*often.*
le lit	*the bed.*	le (la) moindre	*the least.*
le lit de mort	*the deathbed.*	manger	*to eat.*
la connaissance	*the acquaintance, knowledge.*	ronger	*to gnaw, pick.*
		affamé	*famished, hungry.*

A. 1. Votre jeune ami a-t-il été à la campagne aujourd'hui ?
2. Notre voisin a-t-il eu le plaisir de rencontrer son frère ?
3. Leur nièce n'a-t-elle pas été récompensée ?
4. Sa tante n'a-t-elle pas eu patience ?
(a) *In the sentences above put the subject and verb in the plural.*
(b) *Construe the sentences above by using* **Est-ce que . . . ?** *instead of inversion.*
5. Combien de temps le voyageur a-t-il été en Espagne ?
6. Je n'ai jamais été si heureux qu'aujourd'hui ; j'ai reçu la nouvelle que mon frère a reçu une médaille d'or.
7. Les voyageurs n'ont-ils pas eu bien froid en Russie ? *
8. Ils ont eu froid et faim ; souvent ils n'ont pas eu le moindre petit morceau de pain sec à manger.
9. "Personne n'a eu pitié de moi," dit le loup à son lit de mort.
10. N'auraient-ils pas envie de rester ici ?
11. "Où es-tu, Robinson Crusoé ; où as-tu été ?" dit le perroquet.

* *In French the Past Perfect is often used instead of the English Preterite.*

B. 1. "This morning I have had the pleasure of 'meeting' (*say* meet) your mother," said the wolf to the lamb. 2. "As I was hungry, I was very glad 'to make' (**de faire**) her acquaintance." 3. If these lazy pupils had worked, they would be ready now. 4. Has our gardener been in the garden this afternoon ? 5. Have these travellers been in (**en**) Switzerland ?—They have been in Italy and Spain. 6. How long have you 'been working' (*say* worked) ? 7. "Who has been in our cottage ?" said the dwarfs. 8. "Have you not a mind to eat a little bit of mutton ?" asked the fox. 9. "I have not had the least little bone to (à) gnaw," said the hungry [2] wolf [1].

Learn the Past (Prétérit) of Auxiliary and Regular Verbs, pp. 4, 6, 8, 9.

A. 1. Où *fûtes*-vous lundi dernier ?
Je *fus* au Palais de Cristal, où je m'*amusai* beaucoup.

2. Quand *eûtes*-vous treize ans ?
J'*eus* treize ans avant-hier.

3. Où les Romains *attaquèrent*-ils les Gaulois ?
Ils les *attaquèrent* dans leur camp retranché.

4. Quand les Athéniens *bannirent*-ils Thémistocle ?
Ils l'*envoyèrent* en exil en 472 avant J.C. (*sounded* = Jésu-kri).

5. Pourquoi les troupes romaines *rompirent*-elles leurs rangs ?
Parce que la cavalerie ennemie *fondit* sur elles à l'improviste.

DRILL: Conjugate in all persons (1) Yesterday I was at home (§ 31, 5); (2) Last week I had a reply; (3) On that occasion I did not find him; (4) I lost my way in the maze.

The IMPARFAIT is used to describe actions usually or repeatedly done, or *actions which have already been going on at the time spoken of* (*Ex.* 5):—

J'étais très malade quand il arriva.
I was (already) very ill when he arrived.

Les Romains brûlaient leurs morts.
The Romans used to burn their dead.

Quand j'étais à Brighton, je **visitais** l'Aquarium tous les soirs.

Nous attaquâmes les ennemis qui **se retiraient.**
We attacked the enemy whilst they were retreating.

The PRÉTÉRIT is used to relate single historical events, without any reference to their duration, or to their relation with other actions:—

A mon retour, je **fus** très malade.
On my return I was taken very ill (just then, but not before).

Les Romains **brûlèrent** Carthage.
The Romans burnt Carthage.

Hier je **fus** à Brighton, et je **visitai** l'Aquarium.

Nous attaquâmes les ennemis, qui **se retirèrent.**
We attacked the enemy, who thereupon retreated.

B. 1. I lost my way in this great forest, but at last I found a footpath. 2. (The) Queen Dido founded Carthage. 3. Columbus discovered America. 4. Yesterday I found a beautiful necklace. 5. The lion being ill, invited his friends to enter his cavern. 6. The gladiators used to fight in the arena. 7. I came down stairs at half-past six. 8. When I was at the seaside, I used to come down stairs at seven, and I was wont to breakfast at a quarter to eight. 9. *Having* (= *when I had*) replied to his letters, I dined. 10. They were playing, whilst we were working. 11. God created the world.

La peau de l'ours.

A. Un chasseur d'Amérique *raconta* un jour l'anecdote suivante :—L'hiver passé j'*entendis* dire que, dans une des grandes forêts à l'ouest, il y *avait* des ours d'une grandeur extraordinaire. Je *partis* aussitôt pour cette forêt, accompagné d'un de mes amis. Nous ne *rencontrâmes* aucun des ours, et nous *dûmes* le soir rentrer à l'auberge les mains vides. Plusieurs jours après, l'aubergiste *rappela* à mon ami que notre dépense *était* déjà bien grande ; nous *répondîmes :* "Nous vous payerons avec la peau d'un de ces ours."

Enfin, un jour, nous *aperçûmes* deux ours dans la forêt. Ils *marchaient* dans notre direction. Nous *perdîmes* courage ; moi, je *jetai* mon fusil et je *grimpai* sur un arbre ; mais mon ami se *jeta* par terre, retenant l'haleine. Il *avait* entendu dire que les ours ne touchent pas aux cadavres.

Les deux bêtes *approchèrent*, *flairèrent* la bouche, le nez et les oreilles de mon ami, *grommelèrent* comme si elles se *parlaient*, et *s'en allèrent*. Quand elles *furent* bien loin, je *descendis* de l'arbre, et je *dis* à mon ami : Quel secret les ours t'ont-ils confié ?—"Il ne faut pas vendre la peau de l'ours avant d'avoir tué la bête."

In the above story, account for the use of the *Tenses* (in *Italics*)—either *Imperfect* or *Preterite*.

B. 1. Last winter my friends related to-me a pretty story. 2. They were hunting bears in-order-to sell their skins (sing.) 3. For a long time, however, they met no bears (§ 12, 2). 4. At last, one morning, they perceived two bears that were walking in their direction. 5. They lost courage, and threw [away] their guns. 6. One of them climbed a tree, and the other threw *himself* (**se**, *before the Verb* *) on the ground. 7. When the two beasts approached, they grumbled as if they were speaking *to one another* (**se**, *before the Verb* †). 8. When they had gone, *the one* (**celui**) who had climbed the tree, came down. 9. And asked *the* (say—*to-the*) other what secret the bears had confided to him. 10. "First kill the bear, and then sell his skin."

* See p. 20. † See Ex. 28.

18. Dix-huitième Leçon : Pronoms et Adjectifs possessifs.—Syntaxe, §§ 37, 38.

THÈME.

1. The rose has its beauty, its freshness, and its fragrance; but it has also its thorns. 2. A general must always be cool-headed and warm-hearted. 3. Have you heard from him?—Yes; but his letters to me are not edifying in the least. 4. Why have you changed your mind about that project of yours?—Because its success is very doubtful. 5. Our feet are cold; let us draw near the fire. 6. Why fear death if one has lived so as not to dread its consequences? 7. "What is the strength of the army of your king?" a general asked a captured soldier.—"That of steel and iron." 8. Henry the Fourth said one day to his soldiers: "I am your king; you are Frenchmen; there is our enemy." 9. Cheerfulness is the health of the soul; sadness is its poison. 10. Tired of awaiting our enemy behind our retrenchments, we went to meet him. 11. An acquaintance of ours is just now in Switzerland; if you see him, remember us to him, and remind him that he has promised to let us hear from him. 12. Everything in the situation that we covet seems beautiful to us; we see its flowers, but we do not feel its thorns.

GALLICISMES DIALOGUÉS

1. Pourquoi n'êtes-vous pas allé à leur rencontre?—Parce que j'ai mal à la tête.

2. Est-ce votre migraine qui vous reprend?—Oui, et pour comble de malheur, les yeux me cuisent.

3. Je vous plains; mais je vous conseille de ne pas trop vous écouter.—Grand merci; je vous suis on ne saurait plus reconnaissant de vos touchantes consolations.

4. Ainsi vous ne serez pas des nôtres ce soir?—Mais si, votre excellent conseil m'a fait changer d'avis; comptez sur moi.—A la bonne heure!

COMPOSITION.

1. *The Wolf and the Crane.*—A wolf swallowed a bone, which stuck fast in his throat. Suffering great pain, he begged a crane to extract this bone from his throat, and promised him a reward. The latter, thanks to his long neck, successfully performed the operation. But when he asked him for the promised reward: "Thou art an ungrateful [one], my dear gossip," he said to him; "what! thou hast withdrawn thy neck safe and sound from my jaws, and thou darest to claim a reward!"

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demandèrent seulement d'être les ministres de ce temple et de ne pas mourir l'un sans l'autre. Leurs souhaits furent accomplis: la garde du temple leur fut confiée, et parvenus à une extrême vieillesse, ils furent métamorphosés dans le même instant, Baucis en tilleul, et Philémon en chêne.

17. Mercure et le Bûcheron.

Un pauvre bûcheron coupait un arbre au bord d'une rivière. Par malheur, sa cognée tomba dans l'eau ; il la chercha longtemps, mais il ne put la retrouver.

Mercure lui apparut. 'Est-ce là ta cognée, brave homme ?' dit-il, en lui en montrant une d'or. 'Non, cette cognée n'est pas la mienne.'—'C'est peut-être celle-ci ?' dit Mercure, en lui en présentant une d'argent. 'Non, ce n'est point encore celle qui m'appartient.'—'C'est donc celle-ci ?' dit le dieu, en lui en montrant une de fer qui était réellement celle qu'il avait perdue. 'Voici vraiment la cognée dont la perte m'afflige.'—'Prends celle-ci, et encore les deux premières que je t'ai montrées: reçois-les pour prix de ta bonne foi.'

18. Phaéton.

Phaéton ne cessait de se vanter de ses grands aïeux, de son père le Soleil, de son aïeul Jupiter; mais ses camarades se moquaient de sa prétention. Voyant que personne ne voulait croire à son illustre origine, il alla se plaindre à son père ; il lui demanda pour preuve de sa naissance la grâce de conduire un jour son char. Le dieu du jour la lui refusa longtemps, mais enfin il se laissa fléchir. Les chevaux sentirent bientôt que c'était une main novice qui les conduisait : ils s'écartèrent de leur route, et embrasèrent le ciel et la terre. Cybèle, la déesse protectrice de la terre, voyant ses fontaines taries, ses moissons brûlées, ses arbres desséchés avec leurs fruits, et la mer elle-même retirée loin de ses rivages, fit monter ses plaintes vers Jupiter. Le maître des dieux, indigné qu'un orgueilleux jeune homme bouleversât ainsi l'univers, le frappa d'un coup de foudre, qui le précipita dans l'Eridan, fleuve d'Italie que l'on nomme aujourd'hui le Pô.

the measure of their years was full (*quand ils eurent fourni leur carrière*) transformed Philemon into an oak, and, at the same instant, Baucis into a lime-tree.

17. Mercury and the Woodcutter.

There was once upon a time a poor peasant who was crying and lamenting in the thick of a forest. Mercury appeared before him and asked him (§ 36) what (§ 113) *was the matter* (= *he had*). 'I was cutting (§ 10) wood on the bank of a river, and accidentally *dropped* (= *let fall*) my good axe into the water.'—'Is this the axe that thou hast lost?' said the god, showing him (§ 39, *a*) a gold axe. 'Oh dear, no! (Oh, que non!) mine was not so fine as this!'—'Well, here is another (§ 7), perhaps (that) it is thine.'—'That is not mine either; the one (§ 111) that I have lost, is an iron axe (§ 83), and not a silver axe like this.'—'Oh!' exclaimed Mercury, 'no doubt (that) this is yours,' showing him one (§ 7) of iron. 'It is (§ 3) indeed!'—'Then take it, and in reward for (§ 89) thy honesty, I give thee (§ 42) also the other two.'

18. Phaeton.

Phaeton, the son (§ 84) of Apollo, and the grandson of Jupiter, was very proud of his ancestors. As he continually boasted (§ 17) of his high descent, people (§ 108) made fun of his pretensions. Enraged at (§ 49) the jeers of his playmates, he went to (*alla trouver*) his father and asked him (§ 36) to give them a proof of his high parentage. The sun-god would not at first allow himself to be moved (§ 18). At last, however, he gave him permission to drive his chariot. But the horses, feeling that they were driven by an inexperienced hand, rushed out of their usual track, and well-nigh (§ 76) set heaven and earth on fire; the wells were dried up, the crops were burned, the fruits on the trees were parched, and the flowers were withered. When the king of the gods *heard* (= *learnt*) that his presumptuous grandson was upsetting the world, he was so indignant that he struck him with (§ 58) a flash of lightning, and hurled him into the Eridanus, which is supposed to be (§ 62) the same river as the Po.

28. Le Vent de Minuit.

Le vent du nord s'était levé dans la soirée, et vers onze heures il était devenu furieux; il remplissait les airs d'aboiements funèbres; c'était une rage qui ne se peut dire. Les girouettes grinçaient, les tuiles frottaient les unes contre les autres, les poutres des toitures tremblaient dans leurs mortaises, les murailles trésaillaient sur leurs fondements. D'instant en instant, une rafale se précipitait sur ma fenêtre avec des hurlements sauvages, et de mon lit je croyais apercevoir à travers la vitre les yeux sanglants d'une bande de loups affamés. Dans les courts intervalles où ce grand vacarme du dehors s'apaisait, des murmures étranges partaient de l'intérieur du château; les boiseries faisaient entendre de lugubres craquements; il n'était ni fente dans les cloisons, ni fissures aux plafonds d'où ne sortît un soupir ou de rauques gémissements. Et parfois tout cela se taisait, et j'entendais seulement à l'extrémité des corridors comme un léger chuchotement de fantômes qui babillaient dans l'ombre en frôlant les murailles; puis tout à coup, ils prenaient leur élan, les planchers tremblaient sous leur piétinement saccadé; ils gravissaient en tumulte l'escalier qui conduit à ma chambre, et venaient s'abattre sur le seuil de ma porte en poussant des lamentations indicibles.

V. CHERBULIEZ, *Comte Kostia.*

28 (a). En ce moment, un coup de vent furieux, un de ces souffles puissants qui poussent la moitié des mers sur l'autre, et qui rasent les montagnes, pareil au premier cri de la tempête qui s'avançait, emplit le château de tumulte, d'angoisses et de craquements intenses.

Les feuilles arrachées aux branches, les branches arrachées aux arbres, les statues arrachées à leurs bases, une longue et immense clameur, un mugissement lugubre et infini courant dans les galeries et dans les corridors du château, composèrent en ce moment la plus sauvage et la plus lugubre harmonie qui ait jamais vibrée aux oreilles humaines.

A. DUMAS, *Balsamo.*

28. The Night-Wind.

The night-wind has a dismal *trick* of wandering round and round churches, and moaning *as it goes*; and of *trying*, with its unseen hand, the windows and the doors, and seeking out some crevices by which to enter. And *when it has got in, as one not finding* what it seeks, whatever that may be, it wails and howls to issue forth again: and not content with stalking through the aisles, and gliding round and round the pillars, and *tempting* the deep organ, soars up to the roof, and strives to rend the rafters; then flings itself despairingly upon the *stones below*, and *passes*, muttering, *into* the vaults. *Anon* it comes up stealthily, and creeps along the walls, *seeming to* read, in whispers, the inscriptions sacred to the dead. *At* some *of these*, it breaks out shrilly, as *with laughter*; and at others, moans and cries as if it were lamenting. It has a ghostly sound too, lingering within the altar, where it seems *to chaunt*, in its wild way, of wrong and murder *done*, and false gods worshipped, in defiance of the tables of the law, which look so fair and smooth, but are so flawed and broken. Ugh! It has an awful voice, that wind at midnight, singing in a church!

But high up in the steeple! *There* the foul blast roars and whistles! High up in the steeple! There *it is free to come and go* through many an airy arch and loophole, and to twist and twine itself about the giddy stairs, and twirl the groaning weathercock, and make the very tower shake and shiver!

CHARLES DICKENS.

1. *trick*, here = *habit* or *manner*.
2. *as it goes*, say *on the* (**en**) *way*, or turn by *whilst* (**tout en**) *moaning*.
—. *to try*, here **tâter**.
4. say *once entered* . . .
5. say *as if it had not found* . . .
8. *tempting* . . . *organ*, say *to awake the deep sounds of the organ*.
10. **les dalles**, or **le parvis**.
—. *to pass into*, here **s'engouffrer sous** . . .
11. **d'autres fois**.
12. **comme pour**.
13. *at some of these*, here *before some* . . .
14. **par dérision**.
16. *to chaunt* . . . *of* (lit. **psalmodier**), **chanter le récit de** . . .
17. say *committed*.
21. say *it is there that* . . .
22. *to be free*, **se donner carrière**, or **avoir ses entrées**.

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bien surpris de voir que les deux tas étaient toujours pareils; ni l'un ni l'autre ne pouvait intérieurement se rendre compte de ce prodige. Ils firent de même pendant plusieurs nuits de suite; mais comme chacun d'eux portait au tas de son frère le même nombre de gerbes, les tas demeuraient toujours égaux, jusqu'à ce qu'une nuit, ils se rencontrèrent portant chacun les gerbes qu'ils se destinaient mutuellement.

Or, le lieu où une si bonne pensée était venue à la fois si persévéramment à deux hommes, devait être une place agréable à Dieu, et les hommes la bénirent et la choisirent pour y bâtir une maison de Dieu. A. DE LAMARTINE.

2.—Le Fleuve tari.

Il y avait un berger qui gardait les chameaux d'un village au bord d'un lac. Un jour, en abreuvant son troupeau, il s'aperçut que l'eau du lac fuyait par une issue souterraine et il la ferma avec une grosse pierre, mais il y laissa tomber son bâton de berger. Quelque temps après, un fleuve tarit dans une des provinces de la Perse. Le sultan, voyant son pays menacé de la famine par le manque d'eau pour les irrigations, consulta les sages de son empire; et sur leur avis, il envoya des émissaires dans tous les royaumes environnants pour découvrir comment la source de son fleuve avait été détournée ou tarie. Ces ambassadeurs portaient le bâton du berger que le fleuve avait apporté. Le berger se trouvait à Damas, quand ces envoyés y parurent; il se souvint de son bâton tombé dans le lac; il s'approcha et le reconnut entre leurs mains; il comprit que son lac était la source du fleuve, et que la richesse et la vie d'un peuple étaient entre ses mains. — "Que fera le sultan pour celui qui lui rendra son fleuve?" demanda-t-il aux envoyés. — "Il lui donnera," répondirent-ils, "sa fille et la moitié de son royaume." — "Allez donc," répliqua-t-il, "et avant que vous soyez de retour, le fleuve perdu arrosera la Perse et réjouira le cœur du sultan."

Le berger ôta la grosse pierre, et les eaux, reprenant leur cours par ce canal souterrain, allèrent remplir de nouveau le lit du fleuve. Le sultan envoya de nouveaux ambassadeurs avec sa fille à l'heureux berger, et lui donna la moitié de ses provinces. A. DE LAMARTINE.

5.—Une Aventure en Calabre.

Un jour je voyageais en Calabre. C'est un pays de méchantes gens, qui, je crois, n'aiment personne, et en veulent surtout aux Français. De vous dire pourquoi, cela serait long; suffit qu'ils nous haïssent à mort, et qu'on passe fort mal son temps lorsqu'on tombe entre leurs mains. J'avais pour compagnon un jeune homme. Dans ces montagnes, les chemins sont des précipices, nos chevaux marchaient avec beaucoup de peine; mon camarade allant devant, un sentier qui lui parut plus praticable et plus court nous égara. Ce fut ma faute; devais-je me fier à une tête de vingt ans? Nous cherchâmes, tant qu'il fit jour, notre chemin à travers ces bois, mais plus nous cherchions, plus nous nous perdions, et il était nuit noire quand nous arrivâmes près d'une maison fort noire. Nous y entrâmes, non sans soupçon, mais comment faire? Là nous trouvons toute une famille de charbonniers à table, où du premier mot on nous invita. Mon jeune homme ne se fit pas prier: nous voilà mangeant et buvant, lui du moins; car pour moi, j'examinais le lieu et la mine de nos hôtes. Nos hôtes avaient bien mine de charbonniers, mais la maison, vous l'eussiez prise pour un arsenal. Ce n'étaient que fusils, pistolets, sabres, couteaux, coutelas. Tout me déplut, et je vis bien que je déplaisais aussi. Mon camarade, au contraire, il était de la famille, il riait, il causait avec eux: et, par une imprudence que j'aurais dû prévoir, il dit d'abord d'où nous venions, où nous allions, qui nous étions: Français, imaginez un peu! chez nos plus mortels ennemis, seuls, égarés, si loin de tout secours humain! et puis, pour ne rien omettre de ce qui pouvait nous perdre, il fit le riche, promit à ces gens, pour la dépense et pour nos guides le lendemain, ce qu'ils voulurent. Enfin il parla de sa valise, priant fort qu'on en eût grand soin, qu'on la mît au chevet de son lit; il ne voulait point, disait-il, d'autre traversin. Ah! jeunesse, jeunesse! que votre âge est à plaindre! Cousine, on crut que nous portions les diamants de la couronne .... c'étaient les lettres de sa fiancée!

Le souper fini, on nous laisse; nos hôtes couchaient en bas; nous, dans la chambre haute où nous avions mangé; une soupente élevée de sept à huit pieds, où l'on montait

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VERBS: FIRST CONJUGATION.

(3) Verbs marked † are *anomalous*; *i.e.* the derived Tenses are not formed regularly according to § 88.

INDICATIVE PRESENT.	SUBJUNCTIVE PRESENT.	IMPERATIVE.
je **vais**, *I go, etc.* tu **vas**, il **va**, n. all-ons, v. all-ez, ils **vont**.	j' **aill-e**, *I go, etc.* tu **aill-es**, il **aill-e**, n. all-ions, v. all-iez, ils **aill-ent**.	1. —, **allons**, *let us go.* 2. **va**,* *go.* **allez**, *go* (*ye*). * **vas-**, before **en** or **y**:— **vas-en** chercher, *go and fetch some.* **vas-y**, *go there* (*thither*).
I am going away. je **m' en vais**, tu **t' en vas**, il **s' en va**, n. **nous en allons**, v. **vous en allez**, ils **s' en vont**.	je **m' en aille**, tu **t' en ailles**, il **s' en aille**, n. **nous en allions**, v. **vous en alliez**, ils **s' en aillent**.	**va-t' en**, *go* (*thou*) *away.* **allons-nous-en**, *let us go away.* **allez-vous-en**, *go* (*ye*) *away.*
FORM. *I am not going away, etc.* je **ne m' en vais pas**, tu **ne t' en vas pas**, il **ne s' en va pas**, n. **ne nous en allons pas**, v. **ne vous en allez pas**, ils **ne s' en vont pas**.	je **ne m' en aille pas**, etc.	*Do not go away*:— **ne t' en va pas.** *Let us not go away*:— **ne nous en allons pas.** *Do not* (*ye*) *go away*:— **ne vous en allez pas.**

FORM. INDICATIVE PRESENT.

m' en vais-je ? *Am I going away?*
t' en vas-tu ?
s' en va-t-il ?
nous en allons-nous ?
vous en allez-vous ?
s' en vont-ils ?

FORMS COMBINED.

ne m' en vais-je pas ? *Am I not going away?*
ne t' en vas-tu pas ?
ne s' en va-t-il pas ?
ne nous en allons-nous pas ?
ne vous en allez-vous pas ?
ne s' en vont-ils pas ?

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Use of Moods in Dependent Clauses.

§ 149. Introductory.—Either the *Indicative*, the *Conditional*, or the *Subjunctive* may be used in Dependent Clauses :—

Indic.	Il est certain qu'il le **sait.**	Je **sais** qu'il **viendra.**
Condit.	Quand même il le **saurait**, il ne le dirait pas.	Je savais qu'il **viendrait.**
Subj.	Il importe qu'il le **sache.**	Je désire qu'il **vienne.**

The use of one or the other depends entirely on the *meaning either expressed or implied in the Chief Clause:* thus the verb of the Dependent Clause is put—

(*a*) in the *Indicative*, if the Chief Clause implies (*indicates*) that the statement expressed in the Dependent Clause is considered as a *matter of fact*. The fact itself may be true or not, but anyhow it is stated as true.

(*b*) in the *Subjunctive*, if the Chief Clause implies that what is expressed in the Dependent Clause is *contemplated*, *expected*, or *conceived in the mind* of the speaker.

As the term *Subjunctive* implies, the action is represented as being *subjoined to* (under the yoke of) *some leading thought* contained in the Chief Clause—be it a *wish*, an *emotion*, a *doubt*, or any *notion* as distinguished from *fact*.

This mental attitude which a speaker or writer in French assumes towards the action or event spoken of, and subject to which he uses the Verb denoting that action in the *Subjunctive*, may manifest itself either as—

(*a*) a *Wish*, *Command*, *Consent*, *Concession*, or their opposites—a Wish or Command that something may *not* occur, *i.e. Fear* or *Prohibition*;

(*b*) an *Emotion*, as—*Joy*, *Sorrow*, *Shame*, *Indignation*, *Surprise*, etc., or

(*c*) *a Doubt*, *Uncertainty*, *Denial*; under this head must be classed *Result* expected, *Purpose* intended, *i.e. Contingency* or *Anticipation*, in contradistinction to *Accomplished Fact.*

To sum up :—When the Principal Clause of a Complex Sentence contains any idea of *Wish*, *Emotion*, or *Doubt* (either expressed by a Verb, an adverbial Adjunct, or simply understood) in respect of the action described in the Dependent Clause, the Verb expressing that action is put in the *Subjunctive* :—

	Chief Clause :—	*Dependent Substantive Clause*, introduced by **que** :—
(1) (*a*) *Wish* :—	Nous **désirons**	qu'ils **viennent** demain.
(*b*) *Emotion* :—	Je **suis bien aise**	qu'ils **viennent** déjà.
(*c*) *Doubt* :—	Nous **doutons**	qu'ils **viennent** ici.
	Nous **ne croyons pas**	qu'ils **viennent** si tard.

	Chief Clause :—	*Adjective Clause*, introduced by a Relat. Pron. :—
(2) (*a*) *Purpose* :—	Je **cherche** un domestique	qui me **convienne.**
(*b*) *Denial* :—	Il **n'y a personne**	qui en **convienne.**
(*c*) *Assertion* :—	C'est **le seul** tort	dont il **convienne.**

	Chief Clause :—	*Adverbial* Clause, *introduced* by a Conj. :—
(3) (*a*) *Concession* :—	Il est malheureux,	**quoiqu'il soit** riche.
(*b*) *Apprehension*:—	Tenez-vous tranquille,	**de crainte qu'il ne revienne.**
(*c*) *Anticipation* :—	Je me reposerai,	**en attendant qu'il revienne.**

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123 **II.—Place of Adjectives.**

Introductory, and General Rule.—It is a characteristic feature of the French language to place the qualifying (limiting) term *after* the term qualified, as—

la plume **d'acier**, the *steel* pen ; la salle **à manger**, the *dining* room, etc.

Thus also French Adjectives are generally placed *after* the Noun they qualify ; only a few are invariably placed *before ;* nearly all, however, admit of being placed either *before or after*, according as *meaning, emphasis, diction*, or *euphony* may direct ; in other words— the very same Adjective which in the language of *reason, judgment*, or *experience*, is regularly placed *after* the Noun, will, in the diction of *poetry, imagination*, or *emotion*, take its place *before* the Noun.

Accordingly an Adjective is put—

(*a*) *after the Noun*, if used as an *Attribute necessary* for limiting the meaning of a Noun in the particular instance in question, and denoting an *accidental* or *accessory* quality which does not pertain to the whole class of beings expressed by the Noun ;

(*b*) *before the Noun*, if used as an *ornamental Epithet*, intended for picturesque effect, and denoting a quality naturally associated or cognate with the whole class of persons or things spoken of. Compare :—

La couleur **verte.**	Sous la **verte** feuillée.
Un chemin **étroit.**	Une **étroite** liaison (*alliance*).
Un homme **cruel.**	Le **cruel** tyran.
Une couleur **sombre.**	Le **sombre** désespoir.
Une action **criminelle.**	Ce **criminel** attentat.

Thus again, when we say— the *virtuous* man, the *retired* captain, the Adjectives *virtuous, retired*, limit the Nouns *man, captain*, to *distinguish* them from those to which that attribute does not belong, hence— l'homme **vertueux** ; le capitaine **réformé.** But in— *Virtuous* Aristides, the *gallant* captain, the Adjectives are not used to distinguish Aristides or captain from other men of that name, but simply to *characterise* the men, hence—

le **vertueux** Aristide ; le **vaillant** capitaine.

Compare also— L'Arabie **heureuse** (as distinguished from l'Arabie **pétrée**, or **déserte**), with— **Heureuse** enfance ! (not to distinguish it from any other childhood—for childhood is *the* happy age—but expressing as it does an essential quality originating in the very nature of that age). On that principle we may correctly render—

Un ami **fidèle**, by— *a friend that is faithful.*
Un **fidèle** ami, by— *a trusty friend, indeed !*

The Adjective in the latter case denoting a quality ascribed from a *subjective* point of view, *i.e.* as the expression of our *personal emotion, love, admiration.*

Observation.—Compare also—J'ai reçu une nouvelle **affligeante**, with—La ville de Carracas a été détruite par un tremblement de terre ; l'**affligeante** nouvelle se répar[illegible] bientôt dans tout le pays ; in the latter case the Adjective, on account of the al[illegible] well-known intelligence, becomes a mere ornamental epithet.

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FORMERLY ASSISTANT MASTER IN WESTMINSTER SCHOOL

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124 SPECIAL RULES.—Subject to the general laws laid down above, an Adjective in French is placed—

(*a*) as a Rule, *after* the Noun :—

(1) if derived from a *Proper Noun :* as,

La langue **grecque.**
Le monde **parisien.**
Le parti **bonapartiste.**
L'église **anglicane,** etc.

(2) if *Participial :* as,

Une nouvelle **alarmante.**
Une raison **concluante.**
L'ordre **accoutumé.**
Le pont **suspendu.**
Un refuge **assuré.**

(3) if originally a *Substantive :* as,

Un poète **philosophe.**
Les hirondelles sont des oiseaux **voyageurs.**

(4) if denoting *Physical* or *Accidental* qualities, *i.e. Colour, Shape, Taste,* etc. : as,

Des cheveux **blonds.**
Une boîte **carrée.**
Une table **ronde.**
De l'encre **noire.**
Des amandes **amères.**
Un fruit **mûr.**
Une poire **molle.**

(5) if *followed by a Complement :* as,

Une proposition **digne de considération.**
De l'eau **bonne à boire.**

(*b*) exceptionally, *before* the Noun :—

(1) in *poetic diction :*—

Témoin nous que punit la **romaine** avarice.
La **grecque** beauté (Lafontaine).

Here notice the use of a Noun used adjectively with a Genit. in apposition :—

Quel **chien de** commerce !
Notre grand **flandrin de** vicomte.

(4) if used *figuratively,* or for picturesque effect :—

Et nous baisions ses **blonds** cheveux . . . (Chateaubriand).
Une **verte** réprimande.
De **noirs** pressentiments.
D'**amères** regrets.
De **mûres** réflexions.
Une **molle** indulgence.

(5) if qualified by a *short Adverb :* as,

Un **si beau** spectacle.
(or—un spectacle **si beau**).
Cette viande a un **très bon** c

Simple Tenses: **Se défendre,** *to defend one's self.*

Je	**me défends**	*I defend myself*
tu	**te défends**	*thou defendest thyself*
il	**se défend**	*he (it) defends himself (itself)*
on	**se défend**	*one defends one's self*
elle	**se défend**	*she defends herself*
nous	**nous défendons**	*we defend ourselves*
vous	**vous défendez**	*you defend yourselves (yourself)*
ils (elles)	**se défendent**	*they defend themselves*

And thus in all *Simple Tenses:*—**Je me défendais (défendis, défendrai).**

Interrogative: **Se défend-il?** *or* **Est-ce qu'il se défend?** *Does he defend himself? Is he defending himself?*

Negative: **Je ne me défends pas,** *I do not defend myself.*

Interrog. and Neg.: **Ne se défend-il pas?** *Does he not defend himself?*

Imperative: **Défends-toi! Défendez-vous!** *Defend yourself.*
Ne te défends pas! *Do not defend yourself.*

Caution.—Numerous Verbs, Reflexive in French, are not at all, or only seldom, used reflexively in English; most of these are best rendered by the *Passive Voice* (cf. Ex. 23), or by an Active Verb used intransitively:—

Je m'appelle,	*I am called.*	**Je me chausse,**	*I put on my boots.*
Je me trompe,	*I am mistaken.*	**Je me gante,**	*I put on my gloves.*
Je m'étonne,	*I am surprised.*	**Je m'habille,**	*I dress.*
Je me réveille, / **Je m'éveille,**	*I am awaking.*	**Je me lève,**	*I get up, rise.*
		Je me couche,	*I lie down, go to bed.*
Je me porte,	*I am (feel); I do.*	**Je me moque de,**	*I laugh at, make fun of.*

se vendre,	*to be sold, to sell.*	**s'éclaircir,**	*to clear up.*
se comprendre, / **s'entendre,**	*to be understood.*	**s'élever,**	*to rise, arise.*
		s'employer,	*to be used, etc.*
s'enrhumer,	*to catch a cold.*	**se composer de,**	*to be composed of.*
se promener,	*to go for a walk.*	**se reposer,**	*to take rest.*
se parler,	*to be spoken.*	**se repentir (de),**	*to repent, to rue.*

A. 1. Comment *vous portez*-vous?—Je *me porte* très bien, je vous remercie; et vous?

2. Moi, je *me porte* sur mes deux jambes!—Je *me réjouis* de vous voir en si bonne santé.

3. Quand *vous lèverez*-vous enfin, fainéant que vous êtes?—Je *me lèverai* dès que je *me serai* assez *reposé.*

4. *Dépêchez-vous* donc de *vous débarbouiller* et de *vous habiller*, paresseux!—Ne *vous fâchez* pas, je vais *me lever* dans un quart d'heure.

5. Comment *vous appelez*-vous?—Nous *nous appelons* comme nos parents. [comme nous.

6. Et comment donc *s'appelaient* vos parents?—Nos parents *s'appelaient*

7. N'allez pas *vous égarer* dans cette sombre forêt, mes gentils enfants!—Pourquoi pas?—Parce qu'elle est infestée par des ogres, qui vous croqueraient à belles dents. [des choux.

8. Comment *vous occupez*-vous à la campagne?—Je *m'amuse* à planter

B. 1. Les heures *s'envolent* sur l'aile du temps.
2. Les médecins *se porteraient* mal, si tout le monde *se portait* bien.
3. La pelle *se moque* du fourgon (Proverbe).
4. La lumière *se répand* beaucoup plus vite que le son.
5. Qui s'acquitte *s'enrichit.* 6. Qui *s'excuse s'accuse* (Proverbe).
7. La vertu *s'éprouve* et se perfectionne dans l'adversité comme l'or dans le creuset.
8. Le mal arrive avec des ailes et *s'en retourne* en boitant.
9. Ces gens *s'accordaient* comme chiens et chats.
10. L'horizon des connaissances humaines *s'agrandira* de jour en jour.
11. L'origine de cet usage *se perd* dans la nuit des temps.
12. *Aide-toi*, et le ciel t'aidera (Proverbe). 13. *Connais-toi* toi-même.
14. Qui *s'attend* à l'écuelle d'autrui a souvent mal dîné (Proverbe).

C. 1. When shall you go to bed?—We shall go to bed at ten o'clock. 2. They are mistaken. 3. The besieged troops defended themselves like lions. 4. You will catch a cold, if you expose yourself to the draught. 5. How is he?—He is not very well. 6. We don't agree. 7. Butter sells [at] two francs a (*say*, the) pound. 8. The little boy would wash himself, if the water were not so cold. 9. Several verbs are used with a reflexive pronoun (*pronom réfléchi*) for [their] object. 10. The weather was clearing up when we awoke. 11. Yesterday the sun rose at five o'clock, and set at seven. 12. Get up and dress yourselves. 13. The pots called the kettles grimy.

D. *La fourmi et la colombe.*—Une fourmi, étant allée *se désaltérer* au bord d'une fontaine, fut entraînée par le courant et allait *se noyer*, quand une colombe, qui *s'en aperçut*, lui jeta dans l'eau une petite branche d'arbre. La fourmi *s'y posa* et parvint à *se sauver*. Bientôt après arriva un oiseleur qui marchait pieds-nus. Voyant la colombe, il *se préparait* à la tuer; mais soudain la fourmi le piqua au talon. La douleur qu'il ressentit fut si vive qu'il tourna la tête et donna ainsi à la colombe le temps de *se sauver* à tire d'aile.

Imitez la fourmi et soyez reconnaissants envers vos bienfaiteurs.

L'aigle, la corneille et le berger.—Un aigle planait dans l'air; il vit un agneau, fondit sur lui et l'enleva dans ses serres. Une corneille, plus faible, mais non moins gloutonne, vit cet exploit et entreprit de l'imiter; elle fondit donc sur un bélier couvert de laine et voulut *s'en saisir;* mais ses griffes *s'embarrassèrent* tellement dans la toison qu'elle ne put *s'échapper*. "Ah! ah!" dit le berger, "je vous tiens: vous avez beau tâcher de *vous débarrasser:* vos efforts sont inutiles; vous servirez de jouet à mes enfants. Cela apprendra à toute votre race à ne pas imiter l'aigle et à ne rien entreprendre au-dessus de vos forces."

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NOTICE TO ENGLISH EDITION

THIS book, originally intended for schools, and enlarged so as to be used also in colleges, presents for the first time a complete picture of the French language on a relatively small scale. While designed primarily for students, by its broad treatment of the general problems of language, it offers much of interest to a wider public. In the General Introduction the author explains and justifies the scheme which he has adopted. The first sixty pages of the work itself are devoted to a brief survey of the history of the French language as a whole; and the remainder is divided into four books:

Book I., on the Study of the Sounds (or Phonetics); Book II., on Morphology (or Accidence); Book III., on (1) Word-Formation and (2) the Life of Words (or Semantics); Book IV., on Syntax. The object of the author is to explain the forms and usages of Modern French by means of their history. While an elementary knowledge of French is assumed, it is hoped that the translation removes the very real (and often unsuspected) difficulties that the original presents, especially in the Syntax, to the average English student. The text has been carefully revised under the supervision of the French editors, so that this is not only a translation but also a new edition of the book, already a classic in France. Indexes containing references to some 6500 words and phrases, and to 600 prefixes and suffixes have been added; and dates of birth and death of authors quoted, etc., have been introduced. Finally, it should be pointed out that in accordance with the author's intention the book remains accessible to students with no previous knowledge of Latin.

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PREFACE

THIS collection of French idioms does not require a lengthy introduction to the student of the French language.

It was prepared, at my request, for the use of candidates for the L.L.A. title of the University of St. Andrews. Its principal features are:

1. That it contains only such idioms as belong to the spoken language, and as are current in literature, to the exclusion of really obsolete phrases and of slang properly so called.

2. The corresponding idiom in English is *not* given, the meaning of the French phrase being explained, instead, by a synonymous French phrase. This is supported, as the case may be, by an apt quotation, a note on the origin of the idiom, a phrase of a less idiomatic form, or by a circumlocution.

Thus this book is not for beginners who are ignorant of the rudiments of the language, or unacquainted with its ordinary grammatical processes. In this little volume the omission of the English corresponding idiom is deliberate, the purpose being to prevent the learning of idioms by rote, to reserve some occupation for the teacher and for the mind of the learner, and to accumulate in the head of the latter a quantity of synonymous expressions mutually defining each other, and leading the student to the point of speaking, reading, and writing with greater ease.

By this method, it is expected that the student will in every way fare better than if the English idioms, as is usually done, were arranged in columns opposite the French ones. Compilers who are content to do this are like a grocer exhibiting cases of oranges and apples side by side, and who should say, of the former: "These are the apples of Sevilla," and of the latter: Those are the oranges of Normandy."

The knowledge of a French idiom, like that of any other, must be gathered from the stock whence it grew: it has to be compared with, and distinguished from, other French idioms, or synonymic terms, or ordinary non-idiomatic phrases. It has to be traced back to its French origin and shown in its French associations. What does an inexperienced student know about *Il n'y a que le premier pas qui coûte* when he reads in the opposite column: "In for a penny, in for a pound?" The mental images evoked do not correspond. The meaning of neither phrase covers the meaning of the other. Their respective applications are the outcome of different associations.

Of course, in this little volume, no attempt is made at finality and completeness. Considerations of the practical order, such as price, size, and utility forbid. But it claims to be on the right lines. It contains as much as may be needed by boys and girls preparing for examination, and by private students who are not expert French scholars.

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Tête (*suite*).

En faire à sa tête. — Agir d'après sa propre volonté sans écouter les conseils.

Perdre la tête. — Voir *perdre*.

Avoir de la tête. — Etre intelligent ; avoir l'esprit d'organisation.

Avoir la tête chaude. — Se fâcher facilement.

Ex. "Ma femme bien souvent a la tête un peu chaude." (Molière, *Les Femmes savantes.*)

Avoir la tête dure. — Avoir peu d'intelligence.

Tenir la tête. — Occuper la première place.

Tenir tête. — Résister.

Ex. "Mais ce jeune homme connaissait trop le prince pour lui tenir tête en ce moment." (Bourget.)

Faire tête (*à quelqu'un*). — Lui résister ouvertement.

Etre à la tête de. — Etre celui qui dirige.

Se jeter à la tête de quelqu'un. / **Jeter à la tête.** — Voir *jeter*.

Crier à tue-tête. — Voir *tuer*.

Se faire une tête. — Se donner une expression, une apparence voulue.

Ex. "C'est le public qui fait la tête des gens plus qu'ils ne se la font eux-mêmes." (Th. Gautier.)

Faire sa tête. — Prendre de grands airs.

Faire une tête. — Avoir l'air confus ou mécontent.

Une tête de linotte. — Voir *linotte*.

Théâtre.

Coup de théâtre. — Voir *coup*.

Tiers.

Le tiers et le quart. — Les premiers venus ; les uns et les autres.

Ex. "S'il me faut essuyer les objections du tiers et du quart, il n'y a pas moyen de rien faire."

Timbre.

Avoir le timbre fêlé. / **Etre timbré.** / **Avoir le timbre brouillé.** — Avoir l'esprit dérangé.

(*Le timbre est une cloche sans battant frappée en dehors par un marteau ; quand la cloche est fêlée, le son devient faux.*)

Ex. "Et je lui crois, pour moi, le timbre un peu fêlé." (Molière, *Les Femmes savantes.*)

"Il a si bien veillé
Et si bien fait qu'on dit que son timbre est brouillé." (Racine, *Les Plaideurs.*)

"Le brave homme est un peu timbré, c'est le malheur et le chagrin." (Mérimée.)

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L'Émeraude des Incas par CHARLES NORMAND, adapted and edited by the late F. ASTON BINNS, M.A., Balliol College, Oxford, sometime Taylorian Scholar and Exhibitioner, and Assistant Master in Sherborne School. Authorised Edition. First edition, March, 1900; reprinted December, 1900.

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Le Roi des Montagnes par EDMOND ABOUT, adapted and edited by ERNEST WEEKLEY, M.A., late Scholar of Trinity College, Cambridge, Professor of French at the University College, Nottingham. First edition, July, 1899; reprinted September, 1900.

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Cinq-Mars par ALFRED DE VIGNY, adapted and edited by G. G. LOANE, M.A., Assistant Master at St. Paul's School. First edition, 1899.

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Petites Âmes par **EMILE POUVILLON**, edited by **STÉPHANE BARLET**, B. ès Sc. Univ. Gall., F.C.S., Senior Master at the Mercers' School. First edition, November, 1898; reprinted, August, 1899.

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"M. Barlet supplies a short introduction, in which he discusses the literary position of Pouvillon, and shows how eminently the seven short stories are suited as a reading book in schools. We fully agree with his estimate, and congratulate the several editors on their choice. The notes have been written with care, and are helpful."—*Educational Times*, December, 1898.

"*Petites Ames* is good reading for intelligent boys in the fifth form; and Mr. Barlet's notes are excellent."—*Athenæum*, January 7th, 1899.

"Pouvillon's *Petites Âmes* is a much more difficult work, demanding a wide vocabulary and no mean acquaintance with French colloquial idiom. Mr. Barlet has contributed an enthusiastic introductory notice of the writer and his works, with capable notes. Advanced students will be unanimous in thanking Mr. Barlet for bringing to their notice a collection of short stories full of racy wit and robust understanding of human nature."—*Guardian*, January 11th, 1899.

"Pouvillon's work is an interesting addition to Siepmann's admirable French Series. For the advanced student nothing could be better than this edition of *Petites Âmes*—seven stories which are not only faultless in style and interesting in plot, but full of the qualities which make a French 'Reader' of practical utility to the student. The notes and appendices, too, are excellent."—*Publishers' Circular*, January 19th, 1899.

"This volume is one of the series produced under the general editorship of Messrs. Siepmann and Pellissier. Of that series we have already spoken favourably. *Petites Âmes* is a collection of seven interesting stories, and the book has the same appendices as other volumes of the series. It is a very suitable Reader."—*University Correspondent*, March 4th, 1899.

"Pouvillon is a true artist, and a keen student of character. His provincials are drawn from life, and by a not unkindly hand. . . . M. Barlet has done his work in a thorough and conscientious manner."—*Schoolmaster*, March 4th, 1899.

Mon Oncle et mon Curé par JEAN DE LA BRÈTE, adapted and edited by E. C. GOLDBERG, M.A., Head Master of the Modern Side of Tonbridge School. First edition, November, 1898; reprinted, February, 1899; reprinted October, 1900.

"Though a 'moral tale,' it is not one of those 'goody-goody' productions which the French style a *berquinade*. There is no mawkishness, no strained sentimentality about it. But there is genuine pathos and bright humour, with the further attraction of a pure and bright style."—*Glasgow Herald*, December 14th, 1898.

"An adaptation of a well-known French novel by M. Jean de la Brète, entitled '*Mon Oncle et mon Curé*.' The story, an exceptionally bright and healthy tale, has been edited by Mr. E. C. Goldberg, who has supplied it with a short introduction. It makes an admirable reading-book for French classes."—*Scotsman*, December 8th, 1898.

"A pretty little story of the mental and moral growth of an orphaned girl, under the guardianship first of an odious aunt and then of a wise, kindly uncle. The book is a welcome addition to its series. The characters of the story are delicately drawn. The notes are good, and the system of exercises, oral and written, based on the text, makes the edition a valuable school book."—*Academy*, January 14th, 1899.

"A brightly written story of a girl's adventures, mild in plot, healthy in tone, free from mawkish sentiment, abounding in clever characterisation, and not without occasional touches of caricature. The work, which was originally published as late as 1889, and was *couronnée par l'Académie* in the following year, is a type of modern French, pure in style and matter, and may safely be recommended for middle forms in girls' schools, for which it will provide interesting and comparatively easy reading. Mr. Goldberg's notes and exercises on the text seem to us to give exactly the kind of aid that will be required."—*Guardian*, January 11th, 1899.

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"The editors have made a very happy choice in including this charming work of Jean de la Brète among the selections from modern French authors, which they have introduced to English school boys and girls. It is written in a breezy interesting style, and abounds in delicate, and unforced humour. The notes are good. The sentences for *vivâ voce* practice and passages for translation into French enhance its value as a class book."—*Schoolmaster*, March 4th, 1899.

"*Mon Oncle et mon Curé* is, on the whole, easier, and we think more suitable for girls than boys. Mr. Goldberg's notes are judiciously few, but supply as much help as is needed."—*Athenæum*, January 7th, 1899.

L'Anneau d'Argent par CHARLES DE BERNARD, edited by LOUIS SERS, B. ès L., French Master at Wellington College. First edition, May, 1898; reprinted, October, 1898.

"We may say at once that it is quite the best of those that have appeared. A brief introduction tells us all that we require to know about the author. The text is clearly and correctly printed. The notes are excellent; just the right length, well expressed, and trustworthy. The appendices by Mr. Siepmann and M. Pellissier are carefully compiled. . . . The passages for translation into French are in good English. The last appendix (on Word-Formation) is very short this time—only four pages; but it contains some interesting facts, clearly arranged. The book is a welcome addition to our intermediate French reading texts."—*Educational Times*, July, 1898.

"Charles de Bernard was a royalist of whom Thackeray wrote: 'To a person inclined to study the inward thoughts and ways of his neighbours (the French), in that light and amusing fashion in which the novelist treats them, let us recommend the works of Monsieur de Bernard.' This is sufficient to commend the work as in all respects suitable for our young people."—*School Guardian*, July 9th, 1898.

"A book of the same type is *L'Anneau d'Argent*, by Charles de Bernard, of whom Thackeray remarked that he was more remarkable than any other French author for writing like a gentleman. Mr. Louis Sers has added notes which will be of great assistance to the student."—*Saturday Review*, September 17th, 1898.

"The plan of the series is comprehensive, and includes notes, an abundance of words, phrases, and sentences for *viva voce* drill, with continuous passages for translation, all founded on the text, and a few notes on word-formation. M. Sers has made an excellent provision of these aids, and has given us in the introduction a readable biographical sketch of his author."—*Guardian*, September 14th, 1898.

"*L'Anneau d'Argent* is, we think, even better suited for a boy's reading-book. The story is more stirring and adventurous, and the tragic end of the brave, simple, soldier-lover, and the way in which he was mourned, cannot fail to interest and delight every reader. The notes seem to be fuller than those to the companion volume [*L'Abbé Daniel*]. The Drill founded on the text is equally thorough and varied, and the little appendix on Word-formation—dealing with another chapter of French word-lore—is not less valuable."—*Academy*, September 10th, 1898.

"An interesting feature of the text, fully dealt with in the notes, is its abundance of allusion, literary and historical."—*Cambridge Review*, November 24th, 1898.

L'Abbé Daniel par ANDRÉ THEURIET, edited by P. DESAGES, Senior Modern Language Master at Cheltenham College. First edition, May, 1898; reprinted, September, 1898; reprinted, October, 1899.

"M. Desages has rendered good service to the study of French in this country by this edition of Theuriet's beautiful prose idyll. The author is not known among us as he deserves to be. We are too apt to think that contemporary French writers are mainly of the naturalistic school. To many English students of French literature, Theuriet comes as a revelation. He is unexcelled in his word paintings of natural scenery, and he takes for his theme only what is most noble and elevating in human life and character. M. Desages's notes are admirable, and the helps given to the student in the direction of lists of words and phrases and imitative exercises are very helpful."—*Schoolmaster*, October 29th, 1898.

"Well bound, well printed, and well selected, and a credit both to the publishers and the general editors, Messrs. Siepmann and Eugène Pellissier."—*School Guardian*, May 21st, 1898.

"The editors of this volume could not have made a better selection than Theuriet's graceful idyll, which forms an agreeable contrast to a good deal of modern French literature."—*Spectator*, September 24th, 1898.

"Mr. Siepmann has already done very good educational work for Messrs. Macmillan, and the two pretty little volumes of his Advanced French Readers now before us deserve much praise. *L'Abbé Daniel*, with its pathetic story of love, generosity, and renunciation, is a fine example of the short novel in which French writers excel. The Introduction gives a brief account of the author; in the Notes everything that might stop a somewhat advanced schoolboy is explained; and most useful Appendices, for exercises in *vivâ voce* and written translation, founded on the text of the story, with a short chapter on Word-formation, close the book."—*Academy*, September 10th, 1898.

"Such a charming story by one of the foremost French writers of the century cannot long remain unnoticed. The above edition should be in great request as a reader for upper forms."—*Educational Review*, January, 1899.

"That this charming prose idyll should have been well received is only natural. From beginning to end the story is told in simple and graceful language, which is in perfect harmony with the scenery that forms the setting."—*Parents' Review*, April, 1899.

Sacs et Parchemins par JULES SANDEAU, adapted and edited by EUGÈNE PELLISSIER, Professeur Agrégé au Lycée de Rochefort. First edition, March, 1898; reprinted, October, 1898; reprinted, December, 1899.

"The present selection is a very judicious one. Sandeau's French is correct and elegant, the characters introduced are well portrayed, and the pupil cannot but become interested in the narrative. The edition contains the usual helps found in the books belonging to this series, and is marked by the perfection and thoroughness which have distinguished other works entrusted to MM. Siepmann and Pellissier."—*Schoolmaster*, October 29th, 1898.

"The satire of *Sacs et Parchemins* is of a kind which will never lose its freshness as long as the types of purse-proud vulgarity and worldliness at which it is directed exist among us. The very good nature of the writer only makes his picture the more effective."—*Spectator*, September 24th, 1898.

"This is an adaptation of Sandeau's novel, a work which will be found especially profitable to English readers from the description of French life and manners which it contains. It is included in 'Mr. Siepmann's Advanced Series,' but the style is generally clear and flowing."—*Educational Review*, January, 1899.

"*Sacs et Parchemins*, par Sandeau, edited by E. Pellissier. 'Sandeau's chief characteristics,' says M. Pellissier, the editor, 'are the delicacy of his pictures, the refinement of his style and the sound moral tone which reigns throughout his works.' '*Sacs et Parchemins* is a masterpiece of its kind and so admirably adapted in all respects for use in the class-room that it is a wonder no English school edition of it has yet appeared. . . . The style, which is terse and polished, abounds in happy, literary reminiscences, and wit sparkles in every page.'"—*Parents' Review*, April, 1899.

"The aim of Siepmann's French and German Series has already been stated in these columns. It is therefore sufficient for us to record the maintenance of the high standard of excellence which characterized previous volumes. The annotation is judicious and the appendices are admirable."—*Oxford Magazine*, February 1st, 1899.

"The 'Word and Phrase Books' give the English and French (in parallel columns) of the lists of words and phrases for *viva voce* drill which are given in an appendix to the above-mentioned reading books. The keys contain these also, and renderings of the 'Sentences on Syntax and Idioms' and of the 'Passages for Translation.' They appear to have been carefully translated, and will be very welcome to teachers who use the books in question."—*School World*, March, 1899.

La Première Croisade par MICHAUD, edited by V. HOUGHTON, Principal of the Khedivieh College, Cairo. Published, September, 1897; reprinted, January, 1899.

"An excellent reader. Prefaced by a Life of Michaud and an *exposé* of his literary work, together with a good historical introduction, furnished with valuable historical and grammatical notes, the book presents a *tout ensemble* calculated to render it attractive and useful. The appendices by the general editors (Messrs. Otto Siepmann and Eugène Pellissier) are noteworthy. . . . These appendices greatly increase the usefulness of the book."—*Educational Times*, November, 1897.

"The story itself is entrancing, the incidents of it singularly dramatic, and the style, simple and clear as it is, throbs with emotion and stirs with enthusiasm; for it is a tale told by a poet who had felt the rush of the hot pulsations of the heart amid the throes of that crusade for freedom which was proclaimed by the French Revolutionists. It is extremely well suited for reading in class. The notes appended to this edition are grammatical, historical critical, literary, geographical, &c. They are numerous and instructive as well as explanatory. There have been added by the general editors four valuable *appendices*. . . . Everything—except perhaps an index to the matters taken up in the notes—seems to have been provided with foresight and appropriateness which could make this story of the crusades pleasant and profitable as a class-book."—*Educational News*, October 9th, 1897.

"The notes, both grammatical and explanatory, are not only well drawn up, but also bear on points of real importance. The 'words for *viva voce* drill,' and the 'phrases and idioms' systematise what every teacher knows to be indispensable for the advantageous use of any text; and, finally, the 'sentences on syntax and idioms' and 'passages for translation into French,' are an intelligent adaptation of the most rational of the numberless new methods devised for utilising the vocabulary which should be acquired by the process of translation from French into English. All these things considered, the book is a thoroughly good one."—*Glasgow Herald*, October 9th, 1897.

"It is an interesting reading-book of moderate difficulty. . . . The notes are careful, and give all necessary information regarding the subject-matter, a task too often shirked by the annotator of modern-language texts. The appendices are useful, and supply abundant matter for oral practice."—*University Correspondent*, January 8th, 1898.

"It forms a most interesting school reading-book, full of historical and instructive details. . . . A valuable feature is the series of idiomatic phrases for retranslation into French which have been taken from the text. Altogether the editor and publishers are to be commended for placing within our reach such a well-appointed text-book."—*Teachers' Aid*, January 29th, 1898.

GENERAL PREFACE TO THE SERIES

THIS series introduces a number of works by distinguished French authors, such as de Vogüé and Emile Pouvillon, who are prominent in their own country, but whose books have not yet received that recognition among our school classics which is their due; it will also include some of the best productions of Daudet, Copée, Theuriet, and others, of which no English school editions exist; and finally it will contain a few works which, although more familiar, may yet, it is hoped, be welcome in an edition framed on the plan here advocated.

The *advanced* texts are intended for pupils of the Fifth and Sixth forms, and are therefore longer (80-150 pages) and more difficult. The *elementary* texts are shorter (40-80 pages) and fairly easy, so as to suit Third and Fourth Forms; to these a complete alphabetical vocabulary will be added.

Each volume contains enough matter for *one* or *two* terms' reading. The editors, while taking care that the works selected should arouse the pupils' interest, should furnish them with a practical vocabulary and useful phraseology, and should help to cultivate literary taste, will also include in their selection such books as will enable the English reader to acquire a knowledge of France and her institutions, of French life and customs, or, as Thackeray puts it, "to study the inward thoughts and ways of his neighbours."

The *Notes* are not intended to give merely a translation of the difficult passages, nor are they meant to be a storehouse of grammatical curiosities or of philological learning. They aim rather at giving in a clear and concise form such explanations as will help the pupil to overcome all textual difficulties which are out of his reach, and at elucidating historical, geographical, and literary allusions; while reminding the reader at the same time of points of grammar and of constructions which he is apt to forget, illustrating these by parallels taken, if possible, from other parts of the text. As to renderings, the object, as a rule, is to throw out a hint for the solution of a difficulty rather than to give the solution itself,

without, however, excluding the translation of such passages as the pupil cannot be expected to render satisfactorily into good English. Comments are introduced on French life and thought whenever the text affords an opportunity for them. Lastly, information is supplied on word-formation and derivation, where such knowledge is likely to be of real help towards a complete grasp of the various meanings of words, or where it may serve as an aid to the memory.

The Introduction will in each case give a short account of the author and his works, with special reference to the text of the particular volume.

Appendices will be added to each volume by the General Editors, containing—(1) lists of words and phrases for *vivâ voce* drill, which should be learned *pari passu* with the reading; (2) exercises on syntax and idioms for *vivâ voce* practice, which will involve the vocabulary of a certain portion of the text; (3) continuous passages for translation into French, which will bring composition and construing lessons into close relation; and in the case of the advanced texts (4) some chapters on word-formation or etymology of a practical nature.

The addition of these appendices calls perhaps for explanation.

Appendix I.—The practical experience of teachers, the continually recurring verdict of examiners, any man's personal recollection of his own earlier labours in acquiring a new language—all go to prove that want of vocabularly and phraseology is one of the main difficulties with which the learner has always to contend. "Take a dictionary and learn it by heart" is idle advice; teachers and learners alike agree that the sense of a word or phrase is best grasped and most easily remembered in connexion with some context. Again, the system by which each pupil records in a note-book for subsequent revision unfamiliar words and phrases is educationally sound, and has some advantages: the pupil makes the mental effort of selection, and the words so selected are adapted to his special needs. But this system has also many drawbacks: words are often misquoted or misspelt; the revision, if left to the pupil, is often neglected, and if conducted by the master is, in a class of any size, impracticable. The present appendices are designed, not to do away with the pupil's note-book, but to make the revision of a large number of words and phrases practicable in the class-room. It is true that some of the words chosen may be already known to a portion of the class, but the repetition of a few familiar phrases does no harm; while the gain in certainty and facility of revision, and still more in point of time, is enormous. No enunciation of the English is necessary; and it is astonishing how rapidly a form or set, with the page in front of them, will run down a column, and reproduce, in correct French, words and phrases which they have been through once or twice before.

It may be mentioned that the plan is not a theoretical one. Trial has

proved its value beyond anticipation. It has also shown that the pupils themselves soon begin to like this drill, as they feel a growing and tangible addition to their knowledge from week to week.*

Appendices II. and III.—There is no need to say anything of these, as it is now generally recognized that the reading-book should form the nucleus of all instruction in languages.

Appendix IV. is necessarily not exhaustive. But "half a loaf is better than no bread." Word-formation and etymology are not usually dealt with in grammars; moreover, a complete treatment of the subject would be out of place in schools. But some knowledge of word-building and derivation is of interest and use even to schoolboys, and is constantly demanded in our military and other examinations. A short chapter has therefore been added to each of the advanced texts.

In conclusion: as is obvious from the above, it is the object of the present series that the pupil should draw from each successive book some permanent possession in the way of linguistic knowledge and general culture; that the study of each text, while partly an end in itself, should still more be treated as a means to something wider and more lasting.

If this object is to be attained, it is necessary that the pupil should not merely learn to translate the text, but that he should enter into the subject-matter and, to some extent, into the life and interests of the people whose literature he is reading; at the same time he should learn to speak in the foreign language. This result can only be obtained by treating language as a living thing, *i.e.* by such constant repetition as has been suggested of the words and phrases that occur; by regular application of what has been learnt, in *vivâ voce* practice of reproductory exercises and prose passages based on the text; moreover, by careful attention to pronunciation, and by frequent questions, asked and answered in French, upon the subject-matter of the book. It is hoped that no teacher will fail to make such conversational practice an integral part of his work.

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* The lists placed at the end of the text contain the English only. Separate lists with the French added, will also be published for the benefit of masters who might wish their pupils to learn them in home-preparation.

ELEMENTARY.

Note.—Those marked * are ready; those marked † are in the press and the others are in preparation.

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MON ONCLE ET MON CURÉ

PAR

JEAN DE LA BRÈTE

OUVRAGE COURONNÉ PAR L'ACADÉMIE FRANÇAISE

ADAPTED AND EDITED

BY

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— Parce que la perte de sa main ne réparait pas son erreur, répondais-je, que Porsenna n'en était ni plus ni moins vivant, et que le secrétaire ne s'en portait pas mieux.

— Bien, ma petite ; mais Porsenna fut assez effrayé pour lever le siège immédiatement.

— Ceci, monsieur le curé, prouve que Porsenna n'était qu'un poltron.

— Soit ! mais Rome était délivrée, et grâce à qui ? grâce à Scévola, grâce à son action héroïque !

Et le curé, qui, frémissant à l'idée de se brûler le bout du petit doigt, n'en admirait que mieux Mucius Scévola, de s'exalter, de se démener pour me faire apprécier son héros.

— J'en tiens pour ce que j'ai dit, reprenais-je tranquillement ; ce n'était qu'un sot, et un grand sot !

Le curé, suffoqué, s'écriait :

— Quand les enfants se mêlent de raisonner, les mortels entendent bien des sottises.

— Monsieur le curé, vous m'avez appris, l'autre jour, que la raison est la plus belle faculté de l'homme.

— Sans doute, sans doute, quand il sait s'en servir. Puis, je parlais de l'homme fait, et non des petites filles.

— Monsieur le curé, le petit oiseau essaie ses forces au bord du nid.

L'excellent homme, un peu déconcerté, s'ébouriffait les cheveux avec énergie, ce qui lui donnait l'air d'une tête de loup poudrée à blanc.

— Vous avez tort de tant discuter, ma petite, me disait-il quelquefois ; c'est un péché d'orgueil. Vous ne m'aurez pas toujours pour vous répondre, et quand vous

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Page LINE

7. 1. **mouchoir à carreaux**: similarly *un complet à carreaux* means 'a check suit.' *Carreau* (cf. Lat. *quadrum*, a square) has many other meanings; thus p. 22 l. 20, *sur le carreau*, 'on the floor'; p. 27 l. 3, *le carreau de papier*.

,, 6. **le plus courts possible**: why not *les* and *possibles*?

,, 26. **lui faisait ébaucher**: *faire* requires the dat. when the dependent verb has a direct object; cf. note, p. 14 l. 19. *Ébaucher*, 'to make a rough sketch of.' Transl. 'made him heave a gentle sigh.'

„ 31. **voire même**: *voire* (Lat. *verum*) and *même* are equivalents, the former being 'truly,' 'indeed.' *La voire* in Old French, 'the truth'; see note, p. 87 l. 18, *les siennes*.

8. 6. **pour ses héros**: do not sound the *s* final of *ses* before the *h* aspirate. Note: *le héros*, but *l'héroïne*.

,, 7. **les exaltait**: note that *exaltait* has a different meaning here from that of 'exciting,' which it bears in p. 9 l. 13.

,, 13. **fantaisiste**, 'whimsical.' The word implies 'comic fancy,' whereas *fantasque* (p. 38 l. 9) has the sense of 'extraordinary.'

,, 22. **avait beau pousser**: see note, p. 36 l. 6.

,, 25. **Mucius Scévola**: the story of Mucius 'the Left-handed' (*Scaevola*, dim. of *scaevus*, 'left-handed') is told in Livy ii. 12. Having failed in an attempt to assassinate Lars Porsenna, and being taken before the king, he burnt off his right hand to show how little he cared for the tortures that might be inflicted on him.

9. 9. **soit!** pronounce the *t* of this exclamation.

,, 13. **de s'exalter**: the infinitive is sometimes thus used with the preposition *de* instead of the indicative in vivid narrative, like the historic infinitive in Latin.

,, 23. **de l'homme fait**, 'of a grown-up man.'

,, 26. **l'excellent homme**: the adj., when purely descriptive and not serving to distinguish one individual from another, takes the unemphatic place before the noun. This principle, which is often exemplified throughout the book, will not be referred to in the notes again.

10. 3. **je me souciais bien de la vie!** the exclamation implies the opposite of its literal meaning; say 'life, indeed!' or 'what did I care about life?' Cf. p. 69 l. 23.

,, 7. **sa bouche, toujours souriante, se refusant**: distinguish carefully between the pres. part. which is always invariable, and the verbal adjective which agrees.

,, 12. **Tibère avec Vespasien**: Tiberius became Emperor in A.D. 14, Vespasian in A.D. 69. The former is the type of most

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Page	WORDS	WORDS	PHRASES
8	to knead	to be obstinately	to play a part
	the clay	bent upon	to be fond of heroes
	all the more	to shake	if the case should arise . .
	to dabble		
9	the loss	to shudder	the end of the little finger
	thanks to . .	the wolf	a great many stupid things
	a coward, poltroon	pride	he knows how to use it
10	to tease	the nail (*finger*)	to struggle with . .
	to make an effort to . .	the next day	they weary me
	to refuse to . .	the barley-field	to cut into little bits
11	the kitchen-garden	the fist	to catch some one up
	angry, enraged	to hurt	to think fit to . .
	a spot	abruptly	to slam the door angrily
12	a boot	indeed not	to knit one's brow
	the league (*distance*)	to jump	it is not worth while talking about it
	a smile	a fly	to shrug one's shoulders
13	a pinch of snuff	to whirl round	do not talk nonsense
	the point of view	the heel	to lean against the fireplace
	to depend on	to get angry	to be dead and buried
14	the property near . .	above all	to sit down by some one's side
	astounded, flurried	to complain	I have heard her say so
		to approve of sg.	to clap one's hands
15	the fault, shortcoming	to let go, loose	it will end by my getting angry
	to pout, be sulky	stunned, astounded	you will repent of it
	a revolt	the amazement	to give some one a lecture (*scolding*)
16	a laurel-bush	a bone	to cut off some one's retreat
	a fit, paroxysm	to taste	to pretend to do sg.
	furious, raging	to fall back	to make a terrible noise
17	the proof	to recoup, indemnify	from that time
	to open one's heart	the looking-glass	to dare to open one's mouth for whole hours
	a third party	to extol	
18	the palate	to freeze	to rub one's hands
	to rain	the hail	to sit down to table
	to snow	sulphur	in my time
19	to sigh	to burst forth	not otherwise
	the temptation	suddenly	to raise one's eyes to heaven
	bitter	the wrath	to give some one a reproachful [look
20	a scoundrel	beyond	to shake one's head
	to bequeath	insufficient	to be like some one
	agent, instrument	the novel	to have nothing to do with it

23. It is in vain you try, you will not succeed.
24. He did it, which greatly surprised us all.
25. I still abide by what I have said.
26. When you are older, you will not speak like that.
27. If you had lived in their time, they would have torn out your tongue and your nails.

II

1. We had scarcely sat down when the door opened.
2. Do you think there is any one who will accept?
3. I struck the table with my fist, which hurt me a good deal.
4. What will he say, when he comes and sees that?
5. It is such a trifle that it is not worth while mentioning it.
6. I mean him to love me so much that he will not be contented when I am unhappy.
7. "How very illogical you are!" she exclaimed.
8. They have been dead for so many ages that they ought not to interest you much.
9. How should you like me to do the same?
10. You would have agreed together wonderfully well.
11. Had you never heard of him before?
12. If he does not love her, to make up for it he loves her money.
13. We have heard him say so himself.
14. I am afraid that they will guess the cause of our absence.
15. It is not certain that I shall not do so some day or other.
16. "It is evident that you are right," said she, clapping her hands.
17. Was it not you that I met this morning?
18. You ought to have arrived much earlier.
19. You must have been very tired.
20. She had placed herself in front of the door to cut off my retreat.
21. If he begins again, send him about his business.
22. She remained petrified, with her hand in the air.
23. I thought I ought to appear as if I knew a lot about him.

III

1. She silenced me before I had finished my sentence.
2. Not a single day passed without his coming to see us.
3. Can you tell me what the question is about?
4. The good man preferred the heroes of antiquity, whose enterprising spirit nobody need dread any longer.

in me rapidly, and I would enter into arguments which almost drove the poor curé out of his mind. At our lessons, things used to go on all right as long as it was a question of exercises to correct, for, while they were as short as possible, they were always carefully done. But after that we passed on to reading. Now the curé was very fond of the heroes of antiquity, and admired their physical courage. For my part, I shared neither his tastes nor his admiration, but felt a positive antipathy to the Greeks and Romans. It was in vain that the curé got annoyed and argued; I would tease, and worry, and bore him, and eventually he would say, "Miss de Lavalle, you will look over your Roman Emperors again, and you will take care not to confuse Tiberius with Vespasian"; and then he would trot off without saying another word.

CHAPTER II

III

One day the curé and I had scarcely sat down at our table when the door opened, and Perrine entered in a state of great excitement. "Is the house on fire?" my aunt asked. "No, madam, but the cow is in the barley-field, and the rabbits are in the kitchen-garden." When my aunt had rushed out after the servant, I turned to the curé and said, "Do you think there is a woman in the whole world as abominable as my aunt? Do you know what she did yesterday? She beat me! But I have found means of avenging myself." I sat down beside him. "You have heard of my uncle at le Pavol? Now my aunt fears above everything that I shall complain to M. de Pavol, and ask him to take me into his house. I will threaten to write to my uncle." At this moment my aunt came in like a whirlwind. "Reine, come here," she cried. I made a low bow, and jumping on a chair to my aunt's amazement, I slipped out of the window into the garden. In the evening, during dinner, she looked as gracious as a

la cagne, 'coward,' 'cur' (Ital. *cagna, chienne*); *le cagnard*, 'sluggard,' 'loafer,' 'coward.'
OF. *coue* (*queue*), from Lat. *cauda*, 'tail'; *le couard*, 'coward.' (In heraldry *le lion couard* is a lion *qui porte la queue basse.*)
la gueule, 'mouth,' 'jaws'; *le gueulard*, 'screamer,' 'bawler.'
la mouffle, 'muffler'; *le mouflard*, 'a person with a bloated face.'
la mouche, 'fly'; *le mouchard*, 'police-spy,' 'informer.'
la solde, 'pay'; *le soudard*, 'old blade,' i.e. 'an old soldier.'

From verbs :—

baver, 'to drivel,' 'sputter'; *le bavard*, 'gossip.'
babiller, 'to prattle,' 'chatter'; *le babillard*, 'babbler, 'twaddler.'
brailler, 'to bawl,' 'squall'; *le braillard*, 'bawler,' 'screamer.'
crier, 'to cry,' 'shout'; *le criard*, 'crier,' 'shouter.'
fuir, 'to flee,' 'fly'; *le fuyard*, 'fugitive.'
grogner, 'to growl'; *le grognard*, 'grumbler.'
pendre, 'to hang'; *le pendard*, 'scoundrel.'
piller, 'to plunder'; *le pillard*, 'plunderer.'

This suffix is without pejorative force in—

le vieillard, 'old man'; *le montagnard*, 'highlander'; *le Savoyard*, though the people of Savoy prefer to be called *Savoisiens*.

(*b*) *Animals* :—

le canard, 'gander'; *le grisard*, 'badger'; *le renard*, 'fox.'

In *la poularde*, 'a fat pullet,' this suffix is augmentative; in *le chevrillard*, 'a young roebuck,' it is diminutive.

(*c*) *Things* :—

la meule, 'millstone'; *le meulard*, 'large grindstone.'
la bombe, 'bomb'; *la bombarde*, 'bomb-vessel.'

In these two the suffix has augmentative force.

Note also—

le billard, 'billiard-table'; *le brancard*, 'stretcher'; *les épinards*, 'spinach'; *l'étendard*, 'standard'; *le poignard*, 'dagger'; *le placard*, 'placard'; *le milliard*, 'thousand millions'; *le puisard*, 'sink'; *une nasarde*, 'a fillip on the nose'; *la moutarde*, 'mustard'; *la mansarde*, 'garret,' named after the architect Mansard.

(4) -ald, -aud

This suffix is likewise of Teutonic origin, and corresponds to *-wald* in *Grimwald, Reinwald.* It is used in very much the same way as *-ard.* When applied to persons the nouns with this suffix have often both genders, and can also be used as adjectives.

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Mon Oncle et mon Curé

8	to knead	pétrir	to be obstinately bent upon	s'entêter à
	the clay	l'argile (*f*)		
	all the more	d'autant plus	to shake	ébranler
	to dabble	barboter		
9	the loss	la perte	to shudder	frémir
	thanks to . .	grâce à . .	the wolf	le loup
	a coward, poltroon	un poltron	pride	l'orgueil (*m*)
10	to tease	taquiner	the nail (*finger*)	l'ongle (*m*)
	to make an effort to . .	s efforcer de . .	the next day	le lendemain
	to refuse to . .	[refuser de.. se refuser à . . *or*	the barley-field	le champ d'orge
11	the kitchen-garden	le potager	the fist	le poing
			to hurt	faire mal
	angry, enraged	courroucé	abruptly	brusquement
	a spot	un lieu		
12	a boot	une botte	indeed not	ma foi, non !
	the league (*distance*)	la lieue	to jump	sauter
			a fly	une mouche
	a smile	un sourire		
13	a pinch of snuff	une prise de tabac	to whirl round	pirouetter
			the heel	le talon
	the point of view	le point de vue	to get angry	se fâcher
	to depend on	dépendre de		
14	the property	la propriété	above all	par-dessus tout
	near . .	près de . .		
	astounded, flurried	ahuri	to complain	se plaindre
			to approve of sg.	approuver qc.
15	the fault, shortcoming	le défaut	to let go, loose	lâcher
			stunned, astounded	abasourdi
	to pout, be sulky	faire la moue		
	a revolt	une révolte	the amazement	l'ébahissement
16	a laurel-bush	un laurier	a bone	un os
	a fit, paroxysm	un accès	to taste	goûter
	furious, raging	furibond	to fall back	reculer
17	the proof	la preuve	to recoup, indemnify	dédommager
	to open one's heart	s'épancher		
			the looking-glass	le miroir
	a third party	un tiers	to extol	vanter
18	the palate	le palais	to freeze	geler
	to rain	pleuvoir	the hail	la grêle
	to snow	neiger	sulphur	du soufre
19	to sigh	soupirer	to burst forth	éclater
	the temptation	la tentation	suddenly	tout à coup
	bitter	amer	the wrath	le courroux
20	a scoundrel	un sacripant	beyond	au delà de
	to bequeath	léguer	insufficient	insuffisant
	agent, instrument	le suppôt	the novel	le roman

Key to Words and Phrases 5

8	to play a part	jouer un rôle
	to be fond of heroes	en tenir pour les héros
	if the case should arise . .	le cas échéant . .
9	the end of the little finger	le bout du petit doigt
	a great many stupid things	bien des sottises
	he knows how to use it	il sait s'en servir
10	to struggle with . .	être aux prises avec . .
	they weary me	ils m'ennuient
	to cut into little bits	couper en petits morceaux
11	to catch some one up	rattraper qn.
	to think fit to . .	juger à propos de . .
	to slam the door angrily	frapper la porte avec colère
12	to knit one's brow	froncer le sourcil
	it is not worth while talking about it	ce n'est pas la peine d'en parler
	to shrug one's shoulders	hausser les épaules
13	do not talk nonsense	ne dites pas de sottises
	to lean against the fireplace	s'adosser à la cheminée
	to be dead and buried	être mort et enterré
14	to sit down by some one's side	s'asseoir à côté de qn.
	I have heard her say so	je le lui ai entendu dire
	to clap one's hands	battre des mains
15	it will end by my getting angry	je finirai par me fâcher
	you will repent of it	vous vous en repentirez
	to give some one a lecture (*scolding*)	donner une semonce à qn.
16	to cut off some one's retreat	couper la retraite à qn.
	to pretend to do sg.	faire semblant de faire qc.
	to make a terrible noise	faire un tapage affreux
17	from that time	dès lors
	to dare to open one's mouth	oser ouvrir la bouche
	for whole hours	durant des heures entières
18	to rub one's hands	se frotter les mains
	to sit down to table	se mettre à table
	in my time	de mon temps
19	not otherwise	pas autrement
	to raise one's eyes to heaven	lever les yeux au ciel
	to give some one a reproachful look	regarder qn. d'un air de reproche
20	to shake one's head	hocher la tête
	to be like some one	ressembler à qn.
	to have nothing to do with it	être hors de cause

19. Elle lui souhaita la bienvenue d'un air maussade ; après quoi elle se rassit tout d'une pièce.
20. Il y avait des années qu'ils se connaissaient.[1]
21. Je me demandais ce que je ferais si j'étais à sa place.
22. Nous pouvons partir tout de suite ou attendre le prochain train, comme vous voudrez.[2]
23. Vous avez beau essayer, vous ne réussirez pas.
24. Il le fit, ce qui nous surprit tous beaucoup.
25. Je m'en tiens toujours à ce que j'ai dit.
26. Quand vous serez plus âgé, vous ne parlerez pas comme cela.[3]
27. Si vous aviez vécu de leur temps, ils vous auraient arraché la langue et les ongles.

II

1. A peine[4] nous fûmes-nous assis que la porte s'ouvrit
2. Pensez-vous qu'il y ait personne qui accepte ?
3. Je frappai la table du poing, ce qui me fit grand mal.
4. Que dira-t-il, quand il viendra et qu'il verra cela ?
5. C'est une telle bagatelle qu'il ne vaut pas la peine d'en parler.
6. Je veux qu'il m'aime assez pour ne pas être satisfait quand je suis malheureuse.
7. " Que[5] vous êtes peu logique ! " s'écria-t-elle.
8. Ils sont morts depuis si longtemps[6] qu'ils ne devraient guère vous intéresser.
9. Comment aimeriez-vous que j'en fisse autant ?[7]
10. Vous vous seriez entendus à merveille.
11. N'aviez-vous jamais entendu parler de lui auparavant ?
12. S'il ne l'aime pas, elle, en revanche il aime son argent.[8]
13. Nous le lui avons entendu dire à lui-même.
14. J'ai peur qu'ils ne devinent la cause de notre absence.
15. Il n'est pas sûr que je ne fasse pas de même[9] un jour ou l'autre.
16. " Il est évident que vous avez raison," dit-elle en battant des mains.
17. N'est-ce pas vous que j'ai rencontré ce matin ?
18. Vous auriez dû arriver bien plus tôt.[10]
19. Vous avez dû être très fatigué.

[1] Or *Ils se connaissaient depuis des années.*
[2] Or *comme il vous plaira.*
[3] Or *ainsi, de la sorte, de cette façon.*
[4] Or *Nous nous étions à peine . .*
[5] Or *Comme*, or *Combien.*
[6] Or *Il y a si longtemps qu'ils sont morts.*
[7] Or *que je fisse de même.*
[8] Or *sa fortune, ses écus.*
[9] Or *que je ne le fasse pas.*
[10] Or *de bien meilleure heure.*

ment en [1] moi, et j'entrais dans des discussions qui faisaient presque perdre l'esprit au pauvre curé.[2] Pendant nos leçons, les choses allaient bien tant qu'il s'agissait des devoirs à corriger, car, quoiqu'ils fussent aussi courts que possible,[3] ils étaient toujours soignés. Mais après cela nous passions à la lecture. Or le curé aimait beaucoup les héros de l'antiquité et admirait leur [4] courage physique. Pour ma part,[5] je ne partageais ni ses goûts ni son admiration, mais j'éprouvais une antipathie prononcée pour les Grecs et les Romains. Le curé avait beau se fâcher et raisonner, je le taquinais, je l'ennuyais et le harcelais, et il finissait par dire : " Mademoiselle de Lavalle, vous repasserez vos empereurs romains, et vous prendrez soin [6] de ne pas confondre Tibère avec Vespasien " ; et là-dessus il s'en allait en trottinant, sans dire un mot de plus.

CHAPTER II

III

Un jour, le curé et moi, nous nous étions à peine assis à notre table [7] que la porte s'ouvrit et que Perrine entra dans un état de grande agitation. " Le feu est-il à la maison ? demanda ma tante.— Non, madame, mais la vache est dans le champ d'orge et les lapins dans le potager." Quand ma tante se fut précipitée dehors à la suite de la domestique, je me tournai vers le curé et lui dis : " Croyez-vous qu'il y ait dans le monde entier une femme aussi abominable que ma tante ? Savez-vous ce qu'elle a fait hier ? Elle m'a battue ! Mais j'ai trouvé le moyen de me venger." Je m'assis à côté de lui. " Vous avez entendu parler de mon oncle de Pavol ? Eh bien ! ma tante craint par-dessus tout que je ne me plaigne à M. de Pavol et que je ne lui demande de me prendre chez lui. Je la menacerai d'écrire à mon oncle." En ce moment ma tante entra comme un ouragan. " Reine, venez ici," cria-t-elle. Je lui fis un grand salut, et, sautant sur une chaise à son grand ébahissement, je me laissai glisser par la fenêtre dans le jardin. Le soir,[8] pendant le dîner, elle avait l'air aussi gracieux qu'un [9] dogue

[1] Or *chez.*
[2] Or *qui mettaient le pauvre curé à l'envers.*
[3] Or *le plus courts possible.*
[4] Or *dont il admirait le . .*
[5] Or *Pour moi*, or *quant à moi.*
[6] Or *vous ferez en sorte.*
[7] Or *à peine étions-nous installés à notre table, le curé et moi.*
[8] *Le soir*, not *Dans la soirée*, to avoid *dans . . pendant . .*
[9] Or *l'air gracieux d'un . .*

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Sieben und dreißigſte Stunde.—Singular.

(1)	*N.*	**Ich** arbeite.		*I* work.
	A.	Er lobt	**mich.**	He praises *me.*
	G.	Er bedarf	**mein(er).**	He is in need *of -me.*
	D.	Er antwortet	**mir.**	He replies *to-me.*
(2)	*N.*	**Du** warteſt.		*Thou* waitest.
	A.	Ich liebe	**dich.**	I love *thee.*
	G.	Ich gedenke	**dein(er).**	I think *of-thee.*
	D.	Ich ſage	**dir.**	I tell *to-thee.*
(3)	*N.*	**Er** ſpielt.		*He* plays.
	A.	Du ſiehſt	**ihn.**	You see *him.*
	G.	Du gedenkſt	**ſein(er).**[1]	You think *of-him.*
	D.	Du gibſt	**ihm.**	You give *to-him.*
	N.	**Sie** ſpielt.		*She* plays.
	A.	Er ſieht	**ſie.**	He sees *her.*
	G.	Er gedenkt	**ihrer.**	He thinks *of-her.*
	D.	Er giebt	**ihr.**	He gives *to-her.*
	N.	**Es** ſpielt.		*It* plays.
	A.	Ich ſehe	**es.**	I see *it.*
	G.	Ich gedenke	**ſein(er).**[2]	I think *of-it.*
	D.	Ich gebe	**ihm.**	I give *to-it.*

Plural.

(1)	*N.*	**Wir** arbeiten.		*We* work.
	A.	Er lobt	**uns.**	He praises *us.*
	G.	Er bedarf	**unſer.**	He is in need *of-us.*
	D.	Er antwortet	**uns.**	He replies *to-us.*
(2)	*N.*	**Ihr** wartet (**Sie** warten).		*You* wait.
	A.	Ich liebe	**euch (Sie).**	I love *you.*
	G.	Ich gedenke	**eurer (Ihrer).**	I think *of-you.*
	D.	Ich ſage	**euch (Ihnen).**	I tell *to-you.*
(3)	*N.*	**Sie** ſpielen.		*They* play.
	A.	Er ſieht	**ſie.**	He sees *them.*
	G.	Er gedenkt	**ihrer.**	He thinks *of-them.*
	D.	Er gibt	**ihnen.**	He gives *to-them.*

1 The shorter forms **mein, dein, ſein,** are often used in *poetry* and *idioms.*

2 **Seiner** can only be used in reference to *persons*; if referring to *things,* **deſſen, deſſelben, davon,** must be used:—

Ich bin **deſſen** gewiß. I am sure *of-it.*

Ich weiß nichts **davon.** I know nothing *about-it.*

PRACTICE :—

Es iſt **an mir** [1] zu ſpielen,	It is *my turn* to play,
es war **an dir** zu ſprechen, 2c.	It was *thy turn* to speak, etc.
Es ſchmeckt **mir,**	I relish it,
es ſchmeckte **dir,** 2c.	You liked it, etc.

[1] Cf. French :—C'est *à moi* à jouer, etc.

der Lenz (poet.),	*spring, lent.*	**kühlen,**	*to cool.*
vergiß (Imper. of **vergeſſen,**		**erquicken,**	*to refresh.*
Ex. 42),	*to forget.*	**wärmen,**	*to warm.*
fehlen (Dat.),	*to miss, to ail, to be wanting.*	**wie geht's?**	*how are you?*
		es geht mir gut,	*I am well.*
erfreuen,	*to rejoice.*	**unartig,**	*ill-bred, naughty.*
gar nichts,	*nothing at-all.*	**dann,**	*then* (adv.)

A. 1. Vergiß mein nicht!—Ich werde dein nie vergeſſen. 2. Was iſt Ihnen begegnet?—Ein großes Unglück iſt mir begegnet. 3. Was fehlt dir, mein liebes Kind?—Mir fehlt gar nichts. 4. Erinnerſt du dich ſeiner noch?—Ja, ſehr wohl. 5. Geht es ihr gut?—Ja, es geht ihr ſehr gut. 6. Erwarteſt du einen Brief von ihnen?—Nein, ſie erwarten einen von mir. 7. Willſt du mir gehorchen oder nicht?—Ich will Ihnen gerne gehorchen. 8. Es fehlt ihm an Mut. 9. Im Lenz erfreu' ich dich, Im Herbſt erquick' ich dich,
Im Sommer kühl' ich dich, Im Winter wärm' ich dich!

B. 1. What had happened to him?—Nothing good (**Gutes**). 2. Does he remember me?—No, he does not remember you. 3. Does he expect a letter from us?—No, he is expecting one from her. 4. That naughty child will not obey us.—Then punish him. 5. I thank them. 6. I wish you happiness and a long life. 7. It is their turn to speak. 8. What ails him?—Nothing ails him. 9. We don't relish it at all.

C. 1. These German exercises are not difficult. 2. This bookseller has old and new books. 3. Do not forget thy old friends. 4. The true happiness of men consists in the conscientious fulfilment of their duties. 5. Two thousand five hundred and eighty-seven soldiers have returned to-day. 6. I think (believe) it is a quarter to nine. 7. He is very well.

Exercise XX. *The Impersonal Passive Voice.*

Only *Transitive* Verbs that govern the *Accusative* can, as a rule, be used in the *Personal Passive:* whilst—

(*a*) *Intransitive* Verbs, and (*b*) *Verbs that govern the Dative* of the Person, can only be used in the *Impersonal* Passive Voice in German—

Active.	*Passive.*
(*a*) **Man läutet** um zehn Uhr zur Kirche.	**Es wird** um zehn Uhr zur Kirche **geläutet.***
They ring the bells for church at ten o'clock.	
Man tanzte und **ſang bis** ſpät in die Nacht. They danced and sang till late in the night.	**Es wurde** bis ſpät in die Nacht / or, **Bis** ſpät in die Nacht **wurde*** } **getanzt** und **geſungen.**
(*b*) **Man ſetzt** mir **nach.** They pursue me.	**Es wird** mir **nachgeſetzt;** / or, Mir **wird nachgeſetzt.*** I am pursued.
Man erlaubte ihm zu gehen. They allowed him to go. (cf. Fr. 'Il lui a été permis de partir.')	**Es wurde** ihm } **erlaubt zu** / or, Ihm **wurde*** } gehen. He was allowed to go.

* If the sentence does not begin with the Verb, the gram. subj. **es** is omitted; as,

Um Zehn Uhr **wird** zur Kirche **geläutet.**

A. 1. Es iſt keinem römiſchen Prieſter erlaubt zu heiraten. 2. Wird hier deutſch geſprochen?—Ja, hier ſpricht man deutſch. 3. Es iſt nach Ihnen gefragt worden. 4. Wurde Ihnen erlaubt zu bleiben?—Nein, im Gegenteil, es wurde mir verboten zu bleiben. 5. Wurde er nicht ſchwer verwundet?—Ja, es wurde ſogleich nach dem Arzt geſchickt.

B. 1. The slave was pursued. 2. That is not to be expected. 3. Are you allowed to do that?—No, we are strictly forbidden to do it. 4. Do you know that you are being looked for everywhere?—No, I did not know it. 5. We were promised great things. 6. Is the new German-English dictionary already printed?—No, but it is being printed now. 7. When will it be published?—I think it will be published in a fortnight. 8. I was ordered to translate three pages. 9. There was quarrelling and wrangling.

Exercise XXI. *Résumé of the Cases in which the English Passive Voice is rendered by a different construction in German:—*

He *is said* (supposed) *to be* very rich.	Er ſoll ſehr reich ſein. Ex. xvi. (Il *doit* être...).
It *cannot be denied.*	Es läßt ſich nicht läugnen. Ex. xviii.
He *is* not *allowed* to go. (Il ne lui est pas permis...).	Er darf nicht gehen. Ex. xvii. / Es iſt ihm nicht erlaubt zu gehen. Ex. xx.
I had him *punished.* / I ordered him *to be punished.*	Ich ließ ihn beſtrafen. Ex. xviii. (Je le fis *punir*.)
I *have been* told (On m'a dit).	Man hat mir geſagt. / Ich habe mir ſagen laſſen.
That *is understood.*	Das verſteht ſich (Cela s'entend).
The thunder *was heard* to roll.	Man hörte den Donner rollen.

By the *Gerundive*, see pp. 123–5

What is *to be done?*	Was iſt zu thun?
There is nothing *to be gained* by it.	Dabei iſt nichts zu gewinnen.
The physician *is to* (must) *be sent* for.	Man muß den Arzt holen laſſen. / Es muß nach dem Arzt geſchickt werden.
What shall I *be thought* of?	Was wird man von mir denken?

Recapitulation:—

1. They are said to have done their work very well. 2. The dark clouds were seen to pass over the mountains. 3. The master ordered the passive voice to be learnt by heart. 4. It could not be imagined that it was true. 5. There was nothing to be hoped for. 6. What would you be thought of, if you were to do that? 7. We are not allowed to be from home, when once the gates are shut. 8. If you were disposed to do your work well, you would be rewarded. 9. There was nobody to be found. 10. I am (supply—*it*) not accustomed to be treated thus.

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12. Die Sphinx.

Die Sphinx soll ein gewisses Wundergeschöpf gewesen sein, welches den Kopf und die Hände eines Mädchens, den Körper eines Hundes, die Flügel eines Vogels, die Stimme eines Menschen, die Klauen eines Löwen, den Schwanz eines Drachen hatte. Sie saß auf einem Felsen nahe bei Theben in Böotien, und pflegte den Vorübergehenden so schwere Rätsel aufzugeben, daß sie dieselben nicht lösen konnten. Alsdann flog sie zu ihnen hinzu und riß sie zu sich auf den Felsen, und zerfleischte sie entweder mit den Klauen, oder stürzte sie vom Felsen hinab, so daß sie jämmerlich umkamen.

Als einst Oedipus in jene Gegenden gekommen war, legte ihm die Sphinx folgendes Rätsel vor: welches Geschöpf am Morgen vierfüßig, am Mittage zweifüßig, am Abende dreifüßig wäre?—Oedipus deutete das Rätsel und sagte, daß es der Mensch sei. Denn dieser ist in der Kindheit, auf Händen und Füßen kriechend, vierfüßig; wann er Jüngling und Mann geworden ist, zweifüßig; im Alter aber dreifüßig, weil nämlich die Greise auf einen Stab gestützt, einherzugehen pflegen. Als Oedipus so das Rätsel gelöst hatte, stürzte sich die erzürnte Sphinx vom Felsen herab und kam selbst um.

13. Tantalus.

Tantalus war den Göttern so lieb, daß Jupiter ihm seine geheimen Plane anvertraute und ihn zu den Mahlzeiten der Götter zuließ. Aber jener pflegte dasjenige, was er bei Jupiter gehört hatte, den Sterblichen zu verraten. Wegen dieses Frevels wurde er in die Unterwelt verstoßen, wo er im Wasser stehend immer dürstet. Denn so oft er einen Trunk Wasser nehmen will, weicht das Wasser zurück. Ebenso hängen Baumfrüchte über dem Kopfe desselben, aber so oft er dieselben zu pflücken versucht, werden die Zweige in die Höhe entrückt und täuschen den Hungernden.

12. The Sphinx.

The Sphinx was a fabulous animal which the ancients usually represented with the head and hands of a maiden, the body of a winged dog or lion, and the tail of a dragon. It was also supposed to be endowed with a human voice.

Seated (§ 113) on a rock, the Sphinx used to put difficult riddles to every Theban that passed by; and whoever was unable to solve them was either torn to pieces or hurled from the rock. Many Thebans had already miserably perished, when Œdipus came into that neighbourhood. To him the monster put a riddle which ran as follows (§ 115): "There is a creature which in the morning walks on four feet, at noon on two feet, and in the evening on three feet —what (§ 134) animal is it?"—"It is man," answered Œdipus, "who in infancy crawls upon all fours, in manhood stands erect upon two feet, and in old age totters along leaning on a staff." So angry was the Sphinx at seeing (§ 103) herself outwitted that she threw herself down from the rock and was killed on the spot.

13. Tantalus.

Tantalus had endeared himself to Jupiter so much that he was admitted to the banquets of the Olympian gods. Unfortunately he betrayed to (the) mortals the secret plans which the king of gods had entrusted to him. This indiscretion proved his ruin. Banished to the nether world, he was doomed to suffer raging thirst, while standing (§ 98) in the midst of a lake. For whenever he attempted to slake his thirst, the treacherous water receded. And whenever, pressed by hunger, he endeavoured to reach the tempting fruit which hung over his head, the branches would (§ 26) shrink back and mock his ravenous hunger.

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A.—The Dependent Clause AFTER *its Principal Clause:—*

Der Mann iſt aller Ehren wert,
Der alle Ding' zum Beſten kehrt.

Keine That geſchieht, die der Herr nicht ſiehet.

Eiferſucht iſt eine Leidenſchaft,
Die mit Eifer ſucht, was Leiden ſchafft.

Das Glück hilft denen die ſich ſelbſt helfen.
Gebet dem Kaiſer was des Kaiſer's iſt.

Wer einmal lügt, dem glaubt man nicht,
Und wenn er auch die Wahrheit ſpricht.

Treue iſt ein ſeltner Gaſt,
Halt' ihn feſt wo du ihn haſt.

Wie ihr die Sprache auch wendet und dreht,
Die beſte Sprach' iſt die vom Herzen geht.

Man muß das Eiſen ſchmieden, weil es warm iſt.

Frage nicht was Andre machen;
Acht' auf deine eignen Sachen.

Wohin geht man, wenn man zwölf Jahre alt iſt?—Ins dreizehnte.

Der Böſe iſt nie ſchlimmer als wenn er fromm thut.

Tröpflein muß zur Erde fallen,
Muß das zarte Bäumchen netzen,
Muß mit Quellen weiter wallen,
Muß das Fiſchlein auch ergötzen,
Muß im Bach' die Mühle ſchlagen,
Muß im Strom' die Schiffe tragen,
Und wo wären denn die Meere,
Wenn nicht erſt das Tröpflein wäre?

Die grüne Stadt.

Ich weiß euch eine ſchöne Stadt,
Die lauter grüne Häuſer hat.
Die Häuſer, die ſind groß und klein,
Und wer nur will, der darf hinein.

Die Straßen, die ſind freilich krumm;
Sie führen hier und dort herum;
Doch Gaſſen, die gerad ausgeh'n,
Die ſind langweilig anzuſehen.

Die Wege, die ſind, weit und breit,
Mit bunten Blumen überſtreut.
Das Pflaſter, das iſt ſanft und weich,
Und ſeine Farb' den Häuſern gleich.

Es wohnen viele Leute dort,
Und alle lieben ihren Ort;
Ganz deutlich ſieht man dies daraus,
Daß Jeder ſingt in ſeinem Haus.

Die Leute die ſind alle klein,
Denn es ſind lauter Vögelein.
Nun, ſagt, wie heißt die grüne Stadt,
Die lauter grüne Häuſer hat? Ortlepp.

B.—The Dependent Clause BEFORE *its Principal Clause:*—

A Dependent Clause supplies, as we have seen in the Preliminaries (p. xix), the place of a Substantive, Adjective, or Adverb; as such, if placed before its Principal Clause, it affects the order of words in the latter in the same manner as an Object, Complement, Adverb, &c., introducing a Principal Clause. Compare—

Vor Sonnenaufgang Bevor die Sonne aufging	} glühten[1] die Gipfel der Alpen.
Before sunrise Before the sun rose	} *glowed* the peaks of the Alps.

[1] Notice that this placing of the Dependent Clause before its Principal Clause causes the Verb of the latter to follow close upon the Verb of the former. Generally, however, a Conjunction or Adverb, correlative to the term which introduces the first clause, is placed before the latter:—

Wie du ſäeſt, ſo wirſt du ernten.—Wo ein Aas iſt, da ſammeln ſich die Adler.—Wer den Acker pflegt, den pflegt der Acker.

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[SPECIMEN PAGE]

3. Die Ferien

Wir haben Ferien gehabt. Ich bin in der Schweiz gewesen. Es war sehr schön auf den Bergen. Wir hatten schönes Wetter und sind fast die ganze Zeit im Freien gewesen. Ich traf in Luzern eine Schar von Schulfreunden. Sie waren auf dem Rigi gewesen; aber sie hatten keine Aussicht gehabt. Sie fuhren mit dem Dampfer über den See. Ich weiß nicht, was nachher aus ihnen geworden ist. Wir reisten von Luzern nach Interlaken. Auf der Reise bemerkten wir mit Besorgnis, daß das Wetter trübe wurde, und es fielen schon einige Tropfen. Wir dachten, das schöne Wetter würde nun vorüber sein; aber über Nacht war der Himmel wieder ganz klar geworden. Es war nur ein Gewitter gewesen, und wir waren froh, daß unsre Besorgnis unbegründet gewesen war.

Ich ging ins Gebirge und bestieg das Wetterhorn. Die Aussicht war wunderschön. Je höher ich stieg und je müder ich wurde, desto großartiger wurde das Panorama. Es war unten ganz warm; aber allmählich wurde es kälter, und auf dem Gipfel würde ich erfroren sein, wenn ich nicht mein Plaid bei mir gehabt hätte.—Wir werden die nächsten Ferien bei meinem Onkel in Schottland sein. Ich würde lieber nach Deutschland gehen; aber aus diesem stillen Wunsche wird nichts werden. Mein Bruder aus Indien wird Urlaub haben; er wird auch dort sein. Er ist Offizier geworden. Er wird bald Hauptmann werden. Er würde es schon voriges Jahr geworden sein; aber er ist lange krank gewesen. Er ist beinahe dreißig Jahre alt. Wir sind alle gespannt, ihn wiederzusehen. Er wird sich wundern, daß ich so groß geworden bin.

Grammar.—Auxiliary Verbs, §§ 11-14, pp. 108-113. *Exercise* 3, p. 193.

Oral Practice.—(1) Wo bist du in den Ferien gewesen? (2) Was für Wetter habt ihr gehabt? (3) Was ist aus deinen Freunden geworden? (4) Wie war die Aussicht vom Wetterhorn? (5) Wo wirst du die nächsten Ferien zubringen? (6) Warum gehst du nicht nach Deutschland?

4. Conditional Present and Perf. of ſein, haben, werden (in interrog. neg. sent.)

5. Imperative of ſein, haben, werden.

Exercise.—Translate: 1. I am getting tired. 2. He will become ill. 3. Where have you (*Sing.*) been in the holidays? 4. We shall not go to Scotland. 5. It is getting cold. 6. You (*Sing.*) have grown very tall. 7. What has become of your friend? 8. He is going to be (become) an officer. 9. We have had no view. 10. I should be anxious. 11. The sky was becoming clear again. 12. You would have been very tired. 13. Will he be there? 14. He is going to have furlough. 15. Had you not your rug with you? 16. The wind has turned quite cold. 17. I should have been very glad. 18. Had not your anxiety been unfounded? 19. Who is there? 20. It is I. 21. Is it you? 22. No, it is he.

Reproduction.—They are now having holidays. They have been to Switzerland. They have had fine weather all the time. We are going to Lucerne next holidays. We shall ascend the Rigi. I hope that we shall have fine weather, for the view from the top is magnificent. My brother from India will go with us. He would rather go to Germany. We are longing to see him again. He became captain when he was thirty. I too shall become a soldier.

Exercise 4

N.B.—See List of Strong Verbs, pp. 277-279, for Drill.

Drill.—1. Present and Imperfect Passive of loben, lieben, beſiegen.

2. Perfect and Future Passive of fragen, beſchenken (neg.)

3. Pluperf. and Future Perf. Passive of beſiegen, ehren (interrog.)

4. Pres. and Perf. Cond. Passive of lieben, bewundern (interrog. neg.)

CHAPTER XIV.—COMPARISON OF ADJECTIVES

(1) Dieſer Teppich iſt klein; — This carpet is small;
aber dieſer iſt kleiner, — but this one is smaller,
und dies iſt der kleinſte. — and this is the smallest.

Die Äpfel ſind jetzt billig; — Apples are cheap now;
die Birnen werden noch billiger; — pears will get cheaper yet;
die Kirſchen ſind im Juli am billigſten. — cherries are cheapest in July.

Der kleine Teppich; der kleinere Teppich; der kleinſte Teppich.
die billigen Äpfel; die billiger(e)n Birnen; die billigſten Kirſchen.

Positive	Comparative	Superlative
klein (small)	kleiner	kleinſt (der, die, das kleinſte; am kleinſten)
billig (cheap)	billiger	billigſt (der billigſte; am billigſten)

(2) **Adjectives in e, er, el, en.**

trübe (dull, not clear)	trüber	trübſt (der trübſte; am trübſten)
munter (gay)	muntrer	munterſt (der munterſte; am munterſten)
eitel (vain)	eitler	eitelſt (der eitelſte; am eitelſten)
beſcheiden (modest)	beſcheidner	beſcheidenſt (der beſcheidenſte; am beſcheidenſten)

(3) **Adjectives ending with a dental (d, t), sibilant (s, ß, ſch, z) or vowel.**

mild (mild)	milder	mildeſt (der mildeſte; am mildeſten)
laut (loud)	lauter	lauteſt (der lauteſte; am lauteſten)
ſüß (sweet)	ſüßer	ſüßeſt (der ſüßeſte; am ſüßeſten)
hübſch (pretty)	hübſcher	hübſcheſt (der hübſcheſte; am hübſcheſten)
ſtolz (proud)	ſtolzer	ſtolzeſt (der ſtolzeſte; am ſtolzeſten)
frei (free)	freier	freiſt (der freiſte; am freiſten) *or* freieſt (der freieſte; am freieſten)

(4) **Participles.**

reizend (charming)	reizender	reizendſt (der reizendſte; am reizendſten)
gebildet (cultured)	gebildeter	gebildetſt (der gebildetſte; am gebildetſten)
but geſucht (sought after)	geſuchter	geſuchteſt (der geſuchteſte; am geſuchteſten)

85. Regular Comparison.—The degrees of Comparison are formed in German—

by adding **er** to form the Comparative, *e.g.*—

klein (small), Comp. kleiner

by adding **ſt** to form the Superlative, *e.g.* :—

klein (small), Sup. kleinſt
billig (cheap), Sup. billigſt.

86. Comparison of Adjectives in e, er, el.—(*a*) Adjectives ending in **e** are treated as though the **e** were not there, *e.g.* :—

träge (lazy), träger, trägſt
trübe (dull), trüber, trübſt.

(*b*) Adjectives in **er, el, en** generally drop the **e** of their termination in the Comparative, *e.g.* tapfer (brave), tapfrer; edel (noble), edler; offen (open), offner, but not in the Superlative, *e.g.* tapferſt, edelſt, offenſt.

87. Superlative in eſt.—(*a*) The superlative of adjectives ending with a dental (**d**, **t**) or a sibilant (**ß**, **ß**, **ſch**, **z**) is formed in **eſt**, *e.g.* mild (mild), Superl. mildeſt; kalt (cold), kälteſt; ſüß (sweet), ſüßeſt; hübſch (pretty), hübſcheſt; ſtolz (proud), ſtolzeſt.

(*b*) In colloquial German, superlatives like der heißte Tag (the hottest day), die ſüßte Birne (the sweetest pear), are not unusual.

(*c*) Adjectives ending with a vowel can take **eſt** but take more frequently **ſt**, *e.g.* Das freiſte Volk (the freest nation), mein treuſter Freund (my most faithful friend).

Note.—Participles whose last syllable is unaccented always form the superlative in **ſt**, even when ending in **d** or **t**, *e.g.* Das reizendſte Thal (the most charming valley), das gebildetſte Volk (the most civilised nation), but mein geliebteſter Freund (my most beloved friend).

88. Equality.—Equality is expressed in German as in English by certain particles placed before the positive, *e.g.* :—

Er iſt ſo groß wie ich (He is as tall as I).
Er iſt nicht ſo alt wie ich (He is not so old as I).
Er iſt ebenſo alt wie ich (He is just as old as I).
Sie ſind alle gleich alt (They are all of the same age).

Note also: Er iſt weniger fleißig als ſein Bruder,
He is less industrious than his brother.
Er iſt minder begabt als ſein Bruder,
He is less gifted than his brother.

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degree the force of imitation, with those of reasoning and of memory. It is well enough, no doubt, to speak of learning a foreign language as one learns the mother tongue. But, as Mr. Siepmann very reasonably points out, the English student of German is generally something more than a little child when he begins his task. At fourteen or fifteen years of age and upwards there are other faculties than those of imitation which can be brought to bear. The aim of this 'Primer,' as the author, with studied moderation, terms it, appears to be to unite all the available faculties of the mind in obtaining a knowledge of the language, which shall be serviceable at an early stage, and at the same time sound and capable of progressive improvement. The work is in three parts. But these are wholly interdependent, and the progress made in each is simultaneous.

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particularly well chosen for their purpose. Mr. Siepmann lays great stress upon reading aloud and pronunciation, and has prefaced the book with quite an elaborate series of examples of letters and sounds, with directions how they should and also how they should *not* be pronounced. This chapter should be of great use to an English teacher of German."

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University Correspondent.—"This seems to be a very clear and careful grammar well adapted for use in schools. The first part, or 'reader,' is well selected and graduated. The arrangement of the grammatical section is good. Besides the exercises there are easy pieces of continuous prose for translation into German."

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Iphigenie auf Tauris, EIN SCHAUSPIEL, von WOLFGANG VON GOETHE, edited by H. B. COTTERILL, M.A., Silver Medallist Society of Arts, Editor of 'Selections from the Inferno,' of Schiller's 'Lager,' etc. First edition, March, 1899.

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Vor dem Sturm, Roman aus dem Winter 1812 auf 13, von THEODOR FONTANE, edited by ALOYS WEISS, Ph.D., Professor of German at the Royal Military Academy Woolwich. First edition, January, 1899.

"As regards its subject-matter the text of this new volume of the 'Advanced German Series' has been selected with excellent judgment. Dealing as it does with the stirring events that immediately preceded the War of Liberation, the story is interesting and instructive from the historical point of view. It also presents a faithful and vivid picture of the life and manners of the period; it introduces a number of admirably drawn characters, and is written in a style remarkable for its clearness and its purity. Nor should it be omitted that, widely and deservedly popular as was Fontane in his own country up to the very last year of his long career, this is the first attempt that has yet been made to introduce any of his works into English schools. It deserves to be successful not only because of Fontane himself, but also because of his editor. The notes which he has supplied are thoroughly good in every respect—clear and to the point when they are explanatory; well-worded and idiomatic when they contain helps for the translation of difficult passages. The really distinctive features of the work, however, are to be found in the appendices. The 'words and phrases,' the 'exercises on syntax and idiom,' and the 'passages for translation into German,' are the accessories that give the volume its special value and its exceptional practical utility. They have all been drawn up with care, and with that appreciation of difficulties in the language and weak points in the learner which only long experience can give."—*Glasgow Herald*, February 2nd, 1899.

"Mr. Siepmann was fortunate in securing this volume for his series; for the 'Roman aus dem Winter 1812 auf 13' is a good story well told, likely to interest young readers. It is furnished with brief and satisfactory introductions by Professor Weiss, who has also written capital notes."—*Educational Times*, April, 1899.

"A historical novel which glows with the romance of patriotism as it acted within the minds of the men of the 'Prussian Mark of Brandenburg,' of which Fontane was a native, for the realisation of the views on liberation which Fichte had set before the people in his noble *Reden an die Deutschen*, and took its literary initiative from Fontane's admiration of the writings of Sir Walter Scott, could scarcely fail to be interesting. This *Roman aus den Winter* (1812-3) is such a *novelette*. That notable winter saw 'the invincible Napoleon' worsted in the attempted conquest of Russia, and this tale realises to the imagination the times in which the army which the drill of Scharnhorst has made effective, entered on the offensive under the war-cry of 'A stout heart and no peace!' till Europe's gigantic tyrant was crippled. The persons in the story are typical yet individual, but the scenes in which they live and move are set before the eye in genuine reality. The Biography of the author, the Introduction, and the Notes, form an excellent and scholarly equipment for the student, the preparation of which does credit to the editor."—*Educational News*, February 11th, 1899.

"A capital tale of the winter of 1812-13, with a Life of Fontane, a brief historical introduction, and thoroughly satisfactory notes. Mr. Siepmann has himself supplied the appendices, as usual; the fourth of these is an interesting chapter of 'Word Formation,' in which he discusses certain 'suffixes of concrete substantives.'"—*School World*, March, 1899.

Vom ersten bis zum letzten Schuss von HANS WACHENHUSEN, edited by T. H. BAYLEY, M.A., Assistant Master at Loretto School. First edition, October, 1898; reprinted February, 1899.

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"We have already in former notices spoken of Mr. Siepmann's excellent German series, and praised the appendices by the general editor for their novel features, especially for the words and phrases and the sentences on syntax and idioms for *vivâ voce* practice, and also for the introduction of the words and music of German national songs. In a new volume of the series—*Vom Ersten bis zum Letzten Schuss*, by Hans Wachenhusen—Mr. T. H. Bayley has continued the same praiseworthy methods as his predecessors, and the book has also other claims to be welcomed as a text-book for elementary classes. Hans Wachenhusen was war correspondent for several German newspapers for many years, and finally acted for *The Cologne Gazette* during the Franco-Prussian War of 1870. It is with his experience during the last war that the author deals in the book before us. His style is not the classical language of Goethe and Schiller, but the German of to-day, the German which school boys and girls are far more likely to need, and according to our own experience, acquire much more readily. The incidents are vividly detailed, and the book is full of such graphic descriptions of events removed by so short a period from their own lifetime as can hardly fail to arouse the interest of young students."—*Guardian*, January 11th, 1899.

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[SPECIMEN PAGE]

letzten Bank einen halben Eckplatz zu erobern. Aller Erwartungen waren gespannt, und diese sollten nicht getäuscht werden. Das akademische Viertel war noch nicht um, als der kleine Mann mit dem scharfgeschnittenen Profil und den blauen, aber scharf treffenden Augen auf dem Katheder erschien. „Meine Herren," begann er, nachdem er nicht ohne ein Lächeln der Befriedigung seinen Blick über das Auditorium hatte hingleiten lassen, „meine Herren, wir sind alle unter dem Eindruck einer großen Nachricht, die nicht kennen zu wollen mir in diesem Augenblick als eine Feigheit erscheinen würde. Sie wissen, worauf ich hinziele: General York hat kapituliert. Das Wort hat sonst einen schlimmen Klang, aber wir kennen den General und wissen deshalb, in welchem Geiste wir sein Thun zu deuten haben. Ich meinesteils bin sicher, daß dies der erste Schritt ist, der, während er uns zu erniedrigen scheint, uns aus der Erniedrigung in die Erhöhung führt. Es werden auch andre Worte und Auslegungen an Ihr Ohr klingen. Die Feigheit, weil sie sich ihrer selber schämt, sucht sich hinter Autoritätsaussprüchen oder einem Codex falscher Ehre zu decken; ja, sie flüchtet sich hinter den besten Wappenschild dieses Landes. Aber es kann nicht sein, daß die große That kleinmütig gemißbilligt worden sei. Seien wir voll der Hoffnung, die Mut, und voll des Mutes, der Hoffnung giebt. Vor allem thun wir, was der tapfre General that, d. h. entscheiden wir uns."

Enthusiastisch antwortete das Auditorium, dann schwieg alles, und keine weiteren Demonstrationen wurden laut.

Nach der Vorlesung war Lewin zurückgeblieben,

Page LINE

39. 28. **Collegium publicum**: such lectures are open to all students of the University, and without fee.

,, 32. **war alles beſetzt,** 'every seat had been taken.'

40. 3. **das akademiſche Viertel:** say 'the interval.' A lecture at a German University, as a rule, commences precisely fifteen minutes after the hour.

,, 5. **ſcharf treffenden Augen,** 'quick eyes.'

,, 6. **Katheder** (*m* or *n*), 'chair' (from Gr. *καθέδρα*, from which Lat. *cathedra*), chair of a bishop or professor.

,, 22. **Codex** (der), 'code,' spelt with a C on account of its Lat. plural Codices, but also Codexe. Cf. note, p. 38 l. 12.

,, 25. **gemißbilligt,** 'disapproved'; mißbilligen, p.p. mißbilligt; mißbilligen, p.p. gemißbilligt. The shorter past participle is now preferred, regardless of the accent. So also with mißbrauchen, mißhandeln, mißtrauen.

41. 10. **wie ſteht es?** 'how are matters going?'

,, 11. **Bleiſt,** 1762–1823, commanded the infantry of the Prussian auxiliary troops under York in the Russian campaign. Later on he was created Count of Nollendorf for his victory at that place over the French (August 30, 1813), whereby he decided the battle of Kulm, in Bohemia.

42. 3. **ſtimmt die Brandſtätte zu:** ſtimmen zu 'to be in harmony with' 'to correspond to.'

,, 10. **er . . Flamme:** lit. 'he is fire and flame'; say 'he would stake his life.'

,, 11. **Cynismus,** 'cynicism' = churlish severity, contempt for the usual pleasures of life.

,, 15. **Konrektor,** 'subrector.'

,, 20. **Barnim, Lebus,** etc. To show where they are situated it may first be stated: Küstrin (p. 43 l. 11), 51 miles E. of Berlin by rail, at the junction of the Warthe with the Oder, pop. 17,000; Frankfort-on-the-Oder, about 50 miles ESE. of Berlin; see note, p. 43 l. 11 below.

The next four towns have less than 10,000 inhabitants each, viz. *Lebus*, about 6 miles N. of Frankfort, on the Frankf.-Küstrin railway line, which runs along the W. bank of the Oder; *Müncheberg*, about half-way between Berlin and Frankfort, belongs to the *Kreis* (circle) of Lebus; *Freienwalde*, now chief town of the *Kreis* of Upper Barnim, about 40 miles NE. of Berlin, and nearly as much NW. of Küstrin; *Bernau*, about 25 miles WSW. of Freienwalde, and belonging to the *Kreis* of Upper Barnim.

Page	WORDS	WORDS	PHRASES
35	at least	the superiority	to whisper sg. to some one
	square (*adj*)	to chat	to continue the conversation
	the cap	to bow (*refl*)	to be some one's right hand
36	the rest, quiet	the chair	to be resolved to be silent
	the answer	evidently	immediately afterwards
	as a rule	the reproach	I suppose so
37	to despise	moreover	a painful pause followed
	the zeal	the birth	to carry on a feud
	to muddle, confuse	the suspicion	to be frightened back by the responsibility
38	to condemn	the event	with a touch of mockery
	the protection	to be surprised	to suspect some one
	the doubt	the distraction	to disturb the company
39	twice	the lecture	only twice a week
	sufficient	the lecturer	what specially suits him
	the bent, inclination	the lecture-room	in the course of the morning
40	the corner-seat	the impression	a smile of satisfaction
	the expectation	the cowardice	you know what I am driving at
	to deceive	to make up one's mind	I for my part am sure
41	the sentry-box	cunning	one of the front rows
	to be indignant	the misfortune	to go for a walk together
	the court-martial	the ashes	how are things going?
42	offensive	the influence	to be at stake
	the unselfishness	particularly	to have great influence among . .
	occasional	to interest	to have sg. in one's mind
43	in spite of all	incalculable	there is a want of officers
	ready to strike	irreparable	to be ready to strike
	disadvantage	the throne	to set an example
44	the line (*printed or written*)	to intend	it is sufficient
		the hostage	to attach belief to a rumour
	the Court	the draft (*of a document*)	to count on some one
	the rumour		
45	the caprice	the contrast	to have many good points
	incalculable	to lay down	the esprit de corps
	to exist	the bandage	to stare at some one (*astonished*)
46	the return	cordial	to expect some one's return
	breakfast-table	magnificent	to surprise some one suddenly
	to interrupt	the (*last*) will	a legal claim
47	earthly	to sit down	according to his habit
	the possession	the quarters	to give the dog sandwiches
	for the present	peculiar	that is his affair
48	the guard-room	in front	to know of it
	the barracks	skilful	their moral stay is gone
	the fly	to bend	until further notice
49	to assert	to discuss	about midnight

PAGE

35. 5. It was difficult to get a place near the door, because we arrived so late.
6. Having continued the conversation for at least another quarter of an hour, he bowed and left the room.

36. 7. He was resolved to be silent about it, lest the news should disturb the company.
8. Does he know that York has capitulated? I suppose so, for he is the minister's right-hand man.
9. They were evidently disappointed, since they had not expected this reproach.

37. 10. The mere suspicion that he should have acted in an unpatriotic manner aroused sharp opposition.
11. I despise everybody who thinks that he has not acted on the purest motives.
12. I know that he will not be frightened by any responsibility whatsoever.

38. 13. He is the very man I was thinking of.
14. I am surprised that you do not accept his protection, said he with a touch of mockery.
15. Whoever suspects them shows by that how little he understands the latest events.

V

39. 1. What specially suits me are the lectures of Professor X, who lectures twice a week in the course of the morning.
2. It is already eight o'clock, if you wish to be in the lecture-room at a quarter past you will have to make haste.
3. Although he cannot speak English he understands it quite well.

40. 4. We for our part knew what he was aiming at as soon as he had begun, and when we applauded, a smile of satisfaction passed over his face.
5. It is true that he did not deceive our expectations, yet we expected that his lecture would make a deeper impression.
6. We all know in what spirit to interpret his action.
7. Let us make up our minds!

41. 8. We sat in one of the front rows and could hear every word he said.
9. How are things going? Have you heard the latest?
10. Everybody must do what he deems right, and take upon himself the consequences.

[SPECIMEN PAGE]

favourite books were Shakespeare and the Percy Ballads. In order to read them he had learnt English; he did not speak it, it is true, but he understood it well. The first lecture was given by Professor Savigny, who did not seem to have heard of the great event of the day. Then Professor Fichte lectured on 'The true conception of War.' When Lewin arrived, he found all the seats taken, and it was only with difficulty that he obtained half a corner seat on the last bench. In a few minutes the little professor appeared, smiling with satisfaction at the well-filled room. 'Gentlemen,' he began, 'it would be pure cowardice to ignore the great news which has arrived. You know what I refer to: General York has capitulated. For my part I am certain that the general has acted rightly; but I may be wrong. Let us be full of the hope which brings courage, and of the courage which brings hope. But before everything, let us do what the brave general did: let us come to a decision!' After the lecture Lewin met Major von Haacke. 'They will bring old York before a court-martial,' said the latter; 'it may cost him his head.' 'Nonsense! It cannot be. I know York; he has had instructions.' 'I don't think so,' replied Haacke. 'The only instruction which each general receives now is: "Do what seems best to you, and take the consequences yourself!"' Then they separated.

VI

HOHEN-VIETZ, *20th March.*

DEAR LEWIN—Our organisation is complete. We have formed a brigade of veterans, consisting of four battalions. Bamme has taken over the command of the brigade, but there is still a lack of officers. We shall have a war according to old Prussian traditions. Now, listen! The court is leaving Potsdam and going to Breslau. This step is more important than you can imagine. It is said that Napoleon has intended to seize the king and have him taken to a French fortress. The entrance of the king into Breslau is fixed for the 25th; a week later he will summon

(3) verbs, e.g.—

lehren (to teach), der Lehrling (apprentice);
mieten (to hire), der Mietling (hireling);
ſäugen (to nurse), der Säugling (suckling);
taufen (to christen), der Täufling (infant or person receiving baptism).

(4) numerals, e.g.—

erſt (first), der Erſtling (the firstborn, first-fruits);
zwei (two), der Zwilling (twin);
drei (three), der Drilling (one of triplets).

Note also der Schierling (hemlock), der Schilling (shilling).

All nouns in -ling are masculine.

III. Form nouns in -ling from the following words, and give their English meaning :—

der Dichter	das Haupt	der Hof	der Schoß
friſch	neu	fremd	jung
prüfen	ſtrafen	mieten	ſäugen

(3) -el, -ſal, -ſel

The suffix -el is MHG. *-el* from original *-alo*, *-ulo*, *-ilo* for masculine and neuter nouns, and from *-alâ*, *-ulâ*, *-ilâ* for feminine nouns. When the original suffix has an i (*ilo*, *ilâ*) it is marked in modern German by the modification of the vowel in the primary word, e.g. *armilo*, Ärmel (sleeve); *sluzzil*, Schlüſſel (key). The suffix -el is mainly used to form names of *instruments* from verbs, e.g.—

heben (to lift), der Hebel (lever);
ſchlagen (to beat), der Schlägel (mallet, rapier);
fliegen (to fly), der Flügel (wing);
werfen (to throw), der Würfel (die);
henken (to hang), der Henkel (handle of a pot);
ziehen (to pull), der Zügel (rein).

Most nouns in -el denoting instruments are masculine.

The following are further instances :—

der Gürtel (belt), der Meißel (chisel), der Nagel (nail), der Rüſſel (trunk of an elephant), der Scheffel (bushel), der Schnabel (beak), der Stempel (stamp), der Stöpſel (stopper).

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35 at least — wenigſtens
square (*adj*) — quadratiſch
the cap — die Mütze
36 the rest, quiet — die Ruhe
the answer — die Antwort
as a rule — gewöhnlich
37 to despise — verachten
the zeal [fuse — der Eifer
to muddle, con- — verwirren
38 to condemn — verurteilen
the protection — der Schutz
the doubt — der Zweifel
39 twice — zweimal
sufficient [tion — ausreichend
the bent, inclina- — die Neigung
40 the corner-seat — der Eckplatz
the expectation — die Erwartung
to deceive — täuſchen [haus
41 the sentry-box — das Schilder-
to be indignant — entrüſtet ſein
the court-martial — das Kriegs-gericht
42 offensive — beleidigend
the unselfishness — die Selbſt-[ſuchts]loſigkeit
occasional — gelegentlich
43 in spite of all — trotz alledem
ready to strike — ſchlagfertig
disadvantage — der Nachteil
44 the line (*printed or written*) — die Zeile
the Court — der Hof
the rumour — das Gerücht
45 the caprice — die Laune
incalculable — unberechenbar
to exist — beſtehen (*str v*)
46 the return — die Rückkunft
the breakfast-table — der Frühſtücks-tiſch
to interrupt — unterbrechen, ä, o
47 earthly — irdiſch
the possession — der Beſitz
for the present — vorläufig
48 the guard-room — das Wachlokal
the barracks — die Kaſerne
the fly — die Fliege
49 to assert — behaupten

the superiority — die Überlegen-
to chat — plaudern [heit
to bow (*refl*) — ſich verbeugen
the chair — der Stuhl
evidently — offenbar
the reproach — der Vorwurf
moreover — überdies
the birth — die Geburt
the suspicion — der Verdacht
the event — das Ereignis
to be surprised — überraſcht ſein
the distraction — die Zerſtreutheit
the lecture — die Vorleſung
the lecturer — der Vortragende
the lecture-room — der Hörſal
the impression — der Eindruck
the cowardice — die Feigheit
to make up one's mind — ſich entſcheiden, ſchlau [ie, ie
cunning
the misfortune — das Unglück
the ashes — die Aſche
the influence — der Einfluß
particularly — namentlich
to interest — intereſſieren
incalculable — unberechenbar
irreparable — unwieder-bringlich
the throne — der Thron
to intend — beabſichtigen
the hostage — die Geiſel
the draft (*of a document*) — der Entwurf
the contrast — der Gegenſatz
to lay down — niederlegen
the bandage — der Verband
cordial — herzlich
magnificent — prächtig
the (*last*) will — das Teſtament (⌣ ⌣ ⌣́)
to sit down — ſich ſetzen
the quarters — das Quartier
peculiar — ſonderbar
in front — vorn
skilful — geſchickt
to bend — krümmen
to discuss — beſprechen, ä, o

35	to whisper sg. to some one	einem etwas ins Ohr flüſtern
	to continue the conversation	die Unterhaltung fortſetzen
	to be some one's right hand	jemandes rechte Hand ſein
36	to be resolved to be silent	entſchloſſen ſein zu ſchweigen
	immediately afterwards	gleich darauf
	I suppose so	ich vermute es
37	a painful pause followed	eine peinliche Pauſe folgte
	to carry on a feud	ſich gegenſeitig befehden
	to be frightened back by the responsibility	vor der Verantwortung zurückſchrecken
38	with a touch of mockery	mit einem Anfluge von Spott
	to suspect some one	einen verdächtigen
	to disturb the company	die Geſellſchaft ſtören
39	only twice a week	nur zweimal in der Woche
	what specially suits him	was ihm beſonders zuſagt
	in the course of the morning	im Laufe des Vormittags
40	a smile of satisfaction	ein Lächeln der Befriedigung
	you know what I am driving at	Sie wiſſen, worauf ich hinziele
	I for my part am sure	ich meinesteils bin ſicher
41	one of the front rows	eine der vorderſten Reihen
	to go for a walk together	einen gemeinſchaftlichen Spaziergang machen
	how are things going?	wie ſteht es?
42	to be at stake	auf dem Spiel ſtehen
	to have great influence among . .	großen Einfluß haben unter . .
	to have sg. in one's mind	etwas im Auge haben
43	there is a want of officers	es iſt Mangel an Offizieren
	to be ready to strike	ſchlagfertig ſein
	to set an example	das Beiſpiel geben
44	it is sufficient	es genügt
	to attach belief to a rumour	einem Gerücht Glauben ſchenken
	to count on some one	auf einen rechnen
45	to have many good points	viele Vorzüge haben
	the esprit de corps	der Sinn fürs Ganze
	to stare at someone (*astonished*)	einen groß anſehen
46	to expect some one's return	jemandes Zurückkunft erwarten
	to surprise some one suddenly	einen plötzlich überraſchen
	a legal claim	ein geſetzlicher Anſpruch
47	according to his habit	nach ſeiner Gewohnheit
	to give the dog sandwiches	dem Hund mit Fleiſch belegte Brotſchnitten geben
	that is his affair	das iſt ſeine Sache
48	to know of it	davon wiſſen
	their moral stay is gone	ihr moraliſcher Halt iſt dahin
	until further notice	bis auf weiteres
49	about midnight	um Mitternacht

PAGE

38. 14. Ich bin überraſcht, daß Sie ſeinen Schutz nicht annehmen, ſagte er mit einem Anflug von Spott.
15. Wer ſie verdächtigt, zeigt dadurch, wie wenig er die jüngſten Ereigniſſe verſteht.

V

39. 1. Was mir beſonders zuſagt, ſind die Vorleſungen von Profeſſor X, der zweimal die Woche im Laufe des Vormittags lieſt.
2. Es iſt ſchon acht Uhr, wenn Sie um viertel nach im Hörſaal ſein wollen, werden Sie ſich eilen[1] müſſen.
3. Obgleich er nicht Engliſch ſprechen kann, ſo verſteht er es doch ganz gut.

40. 4. Wir unſrerſeits wußten, worauf er hinzielte, ſobald er angefangen hatte, und als wir Beifall klatſchten, ging ein Lächeln der Befriedigung über ſein Geſicht.
5. Es iſt wahr, daß er unſre Erwartungen nicht getäuſcht hat, und doch erwarteten wir, daß ſeine Vorleſung einen tieferen Eindruck machen würde.
6. Wir wiſſen alle, in welchem Geiſte wir ſein Thun zu deuten haben.
7. Entſcheiden wir uns!

41. 8. Wir ſaßen in einer der vorderſten Reihen und konnten jedes Wort hören, das er ſagte.
9. Wie ſteht es? Haben Sie das Neueſte gehört?
10. Jeder muß thun, was ihm gut[2] dünkt und die Folgen auf ſich nehmen.

VI

42. 1. Er hat großen Einfluß unter den Arbeitern.
2. Es ſteht mehr auf dem Spiel, als die meiſten Leute glauben.
3. Was mich am meiſten intereſſiert, iſt die Organiſation der Freiwilligen.

43. 4. Niemand ſollte die Gelegenheit verſäumen, in einer ſo großen Sache ein gutes Beiſpiel zu geben.

[1] Or ſputen. [2] Or recht.

[SPECIMEN PAGE]

ganze Gesellschaft von dem großen Ereignis. Die Herren versicherten,[1] daß sie nicht überrascht seien, während die Damen augenscheinlich enttäuscht waren. Um zwölf (Uhr) fuhren die ersten Wagen vor, und in einer halben Stunde waren die Räume leer.

V

Es war schon acht Uhr vorüber,[2] als Lewin am folgenden Morgen aufwachte. Der feste Schlaf hatte ihm wohlgethan. Dienstag und Freitag waren Vorlesungstage, und so begab er sich denn zur Universität. An den andern Tagen blieb er zu Hause. Seine Lieblingsbücher waren Shakespeare und die Percysche Balladensammlung.[3] Um sie zu lesen, hatte er Englisch gelernt; er sprach es zwar nicht, aber er verstand es gut. Die erste Vorlesung gab Professor Savigny; er schien von dem großen Ereignis des Tages nichts gehört zu haben. Dann las Professor Fichte über den „Begriff des wahrhaften Krieges." Als Lewin eintrat, fand er alle Sitze besetzt, und nur mit Mühe kriegte er einen Eckplatz in der letzten Reihe. Nach einigen Minuten erschien der kleine Professor und lächelte mit Befriedigung über den dicht gefüllten Hörsaal.[4] „Meine Herren," fing er an, „es wäre nichts als Feigheit, die große Nachricht, die eingetroffen ist, zu ignorieren.[5] Sie wissen, worauf ich hinziele[6]: General York hat kapituliert. Ich meinesteils bin sicher,[7] daß der

[1] Or erklärten.
[2] Or Erst nach acht Uhr erwachte . .
[3] Or die Percyschen Balladen.
[4] Or über das dicht gefüllte Auditorium.
[5] Or außer acht zu lassen.
[6] Or anspiele.
[7] Or gewiß.

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MACMILLAN'S GERMAN IDIOMS

SELECTION OF GERMAN IDIOMS

PREPARED AND TRANSLATED BY
MYRA TAKER

UNDER THE DIRECTION OF
F. F. ROGET

LATE LECTURER IN THE UNIVERSITY OF ST. ANDREWS; ENGLISH LECTURER IN THE UNIVERSITY OF GENEVA

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EXTRACT FROM PREFACE

In this book the German idioms are translated, or explained, as the case may be, in the English language. But care has been taken not to place *alone*, by way of translation, opposite a German idiom, an English idiom, which, though the acknowledged equivalent of the first, bears no analogy to it, and may be of a totally different order.

The authors of this book have put it together for the benefit of students, who, in their reading or in conversation, cannot but be frequently stopped by a baffling idiom. Such students will find in the pages of this handy *thesaurus* of some three thousand phrases the desired meaning or meanings, with some useful particulars and frequent examples.

The vast majority of idioms are *figurative* expressions. A dictionary of idioms is therefore not a lexicon. It expounds phrases, not words. And as a people will mint widely different figures of speech for thoughts fundamentally synonymous, the nature of the figure becomes the determining feature of an idiom.

On that account, words and phrases are marked in this manual as *figurative*, when their use is quite general; as *figurative and colloquial*, when they belong to the *spoken* language; as *figurative and familiar*, when they belong to the domestic circle and are favourites with the young; as *figurative and slangy*, when "mater-familias" or the governess would frown at them.

[SPECIMEN PAGE]

Da hapert es! *fig. fam.* — There's the rub! v. holpern.

Happen, *m. fam.* — Bit, mouthful.

Harniſch, *m.* — v. geharniſcht.

In Harniſch geraten, *fig. coll.* — To fly into a passion.

Jemanden in Harniſch bringen *or* jagen, *fig. coll.* — To anger, irritate any one, to drive any one wild.

Haſe, *m.*

Sehen, wie der Haſe läuft, *fig. coll.* — To wait to see how things will turn out, to look, to see which way the wind blows.

Da liegt der Haſe im Pfeffer, *fig. coll.* — That's the knotty point; what a fix! v. Hund.

Haſe, *m.*; Haſenfuß, *m.*; Haſenherz, *n. fig. coll.* — Coward, chicken-hearted fellow.

Ex.: Ich habe den Herren erklärt, daß ſie alleſammt Haſenfüße wären.

Haſenpanier, *n.*

Das Haſenpanier ergreifen, *coll.* — To flee, to take to one's heels.

Haſpeln, *intr. v. fig. prov. and fam.* — To chatter, to jabber; v. abhaſpeln.

Hätſcheln, *tr. v. fam.* — To fondle, to pet, to caress.

Ex.: Sie wird von aller Welt gehätſchelt und auf Händen getragen.

Haube, *f.*

Unter die Haube bringen; unter die Haube kommen, *coll.* — To get a girl settled, married; to set up house, to get married.

Ex.: Die Mutter hatte Mühe ihre ſechs Töchter unter die Haube zu bringen.—Vierzig Jahre wurde ſie, ehe ſie unter die Haube kam.

Haudegen, *m.*, alter Haudegen, *fig. coll.* — Old trooper, old blade; v. Degen.

Haufen, *m.*

Der gemeine *or* der große Haufen. — The multitude, the vulgar herd.

In hellen Haufen. — In crowds.

[SPECIMEN PAGE]

Ich mache mir nichts aus ihm, *coll.* — He is quite indifferent to me; I do not like him.

Ich weiß nicht, was ich aus dir machen ſoll, *coll.* — I do not know what to think of you, I cannot make you out.

Ex.: Sie muſterte den wilden Jägersmann und war ſich nicht klar, was ſie aus ihm machen ſollte.

Sich machen, *coll.* — To look, to seem. To come right, to turn out for the best.

Ex.: Ida hat ſich wie immer prächtig gemacht.—Seien Sie nur geduldig, mit der Zeit wird es ſich ſchon machen.

Er macht ſich, *coll.* — He turns out well.

Sich an jemanden machen, *coll.* — To accost, to buttonhole, to apply to, to curry favour with.

Ex.: Kluge Leute machen ſich an reiche Leute.

Was machen Sie? *fig. fam.* — How do you do? how are you?

Ex.: Was machſt du heute? ganz munter?

Machen, *fam.* — To be quick, to get on.

Mach! Macht! Machen Sie! — Be quick! Be alive! Look sharp! etc.

Ex.: Mach! erzähl, erzähle!—Nun macht, ſchnell!—Ich mache ſchon! —Er macht ja!

Mache, daß du fort kommſt! — Begone! Clear out! Be off with you!

Ex.: Ich habe euch ſchon zu lange angehört; macht, daß ihr fortkommt.

Mage, *m.*, *pl.* —n, *obs.* — Relative, kindred.

Schildmage *or* Schwertmage, *m.*; Spillmage, *f. obs.* — Relative on the father's side; relative on the mother's side.

Magen, *m.*

Das liegt mir im Magen, *fig. fam.* — I am sick of that; I cannot forget, get over, digest, pocket that.

Ex.: Der Handel mit Emersleben liegt ihm im Magen. Haſt du etwas Näheres darüber erfahren?

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Specimen Page of the Text of Heine's
"Lieder und Gedichte."

9

Auf Flügeln des Geſanges,
Herzliebchen, trag' ich dich fort,
Fort nach den Fluren des Ganges,
Dort weiß ich den ſchönſten Ort.

Dort liegt ein rotblühender Garten
Im ſtillen Mondenſchein;
Die Lotosblumen erwarten
Ihr trautes Schweſterlein.

Die Veilchen kichern und koſen,
Und ſchaun nach den Sternen empor;
Heimlich erzählen die Roſen
Sich duftende Märchen ins Ohr.

Es hüpfen herbei und lauſchen
Die frommen, klugen Gazell'n;
Und in der Ferne rauſchen
Des heiligen Stromes Well'n.

Dort wollen wir niederſinken
Unter dem Palmenbaum,
Und Liebe und Ruhe trinken
Und träumen ſeligen Traum.

[Specimen Page of Notes to Heine's "Lieder und Gedichte."]

It treats of the old and ever new theme of unhappy love in its various shades, and this circumstance imparts to the poems a certain unity.

Prolog. Es war' mal, etc. The poetical vision contained in the Prolog originally appeared in the tragedy of „Almanſor," where it is sung by a harp-player. In 1822 it was published in a Muſenalmanach under the heading of Das Lied vom blöden Ritter, but when embodying the Lyriſches Intermezzo in the Buch der Lieder, Heine placed it under its present title at the beginning.

P. 41, *No.* 3. Bronne, poetical for "source."

P. 42, *No.* 4. *Stanza* 2. So muß, etc. This line simply expresses the height of emotion felt by the poet on hearing the joyful assurance that he is loved.

P. 44, *No.* 9. Auf Flügeln, etc. This celebrated poem, like several others in the present collection, is the outcome of Heine's enthusiasm for India, which is supposed to have been kindled by the description of that country by the celebrated Sanscrit scholar Franz Bopp. Heine felt a natural longing for the Indian dreamland, and the language of his Indian poems is throughout in harmony with that land of fairy tales.[1]

P. —, *No.* —. *Stanza* 2. The red-flowering lotus (Nelumbo) is the most beautiful of those water-lilies to which the Indians ascribe a mysterious and sacred character.

P. 45, *No.* 10. Die Lotosblume, etc. It is a fact that the lotus-flower shrinks from the glare of the sun, and droops in the day-time.

P. —, *No.* 11. Im Rhein, etc. A picture of the Virgin Mary (painted on wood) is in the Cologne Cathedral. „Die Figur der Madonna," says Hessel, „hat auf dem Dombild zum Hintergrund einen blumendurchwirkten, von Engeln gehaltenen Goldteppich."

[1] „Heine ſehnte ſich nach Indien," says George Brandes, „wie Goethe nach Italien; geiſtig war er an den Ufern des Ganges heimiſch, wie Goethe an denen der Tiber."

[Specimen Page of the Text of the "Balladen und Romanzen."

J. N. Vogl.

LXXIV.

Das Erkennen.

Ein Wanderburſch, mit dem Stab in der Hand,
Kommt wieder heim aus dem fremden Land.
Sein Haar iſt beſtäubt, ſein Antlitz verbrannt;
Von wem wird der Burſch wohl zuerſt erkannt?
So tritt er ins Städtchen, durchs alte Thor,
Am Schlagbaum lehnt juſt der Zöllner davor.
Der Zöllner, der war ihm ein lieber Freund,
Oft hatte der Becher die beiden vereint.
Doch ſieh—Freund Zollmann erkennt ihn nicht,
Zu ſehr hat die Sonn' ihm verbrannt das Geſicht.
Und weiter wandert nach kurzem Gruß
Der Burſche und ſchüttelt den Staub vom Fuß.
Da ſchaut aus dem Fenſter ſein Schätzel fromm,
„Du blühende Jungfrau, viel ſchönen Willkomm'."
Doch ſieh—auch das Mägdlein erkennt ihn nicht,
Die Sonn' hat zu ſehr ihm verbrannt das Geſicht.
Und weiter geht er die Straß' entlang,
Ein Thränlein hängt ihm an der braunen Wang'.
Da wankt von dem Kirchſteig ſein Mütterchen her,
„Gott grüß' Euch!"—ſo ſpricht er und ſonſt nichts mehr.
Doch ſieh—das Mütterchen ſchluchzet voll Luſt:
„Mein Sohn!"—und ſinkt an des Burſchen Bruſt.
Wie ſehr auch die Sonne ſein Antlitz verbrannt,
Das Mutteraug' hat ihn doch gleich erkannt.

[Specimen Page of the Introduction to the "Balladen und Romanzen."]

III.

'It is the honourable characteristic of Poetry that its materials are to be found in every subject which interests the human mind.' This weighty saying of Wordsworth found its practical application on a large scale in the ballad-literature of Germany during the third stage of its development. If the antiquarian notion that the old ballad alone has a claim to be considered as a ballad had been rigidly accepted, narrative poetry would have been confined to a very narrow compass. Fortunately the barrier was broken, first by the great luminaries of German poetry, Goethe and Schiller, and subsequently by Uhland and Heine, whose examples were considered *maszgebend*, and excited a lively emulation among their contemporaries and successors. This was the case to such a degree that every theme capable of being treated as a short narrative in verse, was considered as a legitimate topic for a ballad. There arose consequently such a great variety of ballads that during the Third Period of German ballad poetry they had lost entirely the stamp of uniformity, and there was in fact only one poet whose productions in this branch were 'epoch-making.' This poet was *Ferdinand Freiligrath.*

The great merit of Freiligrath's poems, both lyrical and narrative, consists in the novelty of his subjects, in the vigour of his language, in his many-coloured images, and in the picturesqueness of his details. His muse left the homely village-green, so to speak, and wandered forth into untrodden regions. His fancy carried him to the deserts of Syria and Africa, and the primeval forests of America, and his descriptions of people and scenery were quite in harmony with his exotic topics. Even his rhymes were not of the ordinary kind. They were new, like the subjects he

[Specimen Page of the Text of the "Deutsche Lyrite."]

LXVII.

Neue Liebe neues Leben.

Herz, mein Herz, was ſoll das geben?
Was bedränget dich ſo ſehr?
Welch ein fremdes, neues Leben!
Ich erkenne dich nicht mehr.
Weg iſt Alles, was du liebteſt,
Weg, warum du dich betrübeſt,
Weg dein Fleiß und deine Ruh —
Ach, wie kamſt du nur dazu!

Feſſelt dich die Jugendblüthe,
Dieſe liebliche Geſtalt,
Dieſer Blick voll Treu' und Güte
Mit unendlicher Gewalt?
Will ich raſch mich ihr entziehen,
Mich ermannen, ihr entfliehen,
Führet mich im Augenblick,
Ach, mein Weg zu ihr zurück.

Und an dieſem Zauberfädchen,
Das ſich nicht zerreißen läßt,
Hält das liebe, loſe Mädchen
Mich ſo wieder Willen feſt;
Muß in ihrem Zauberkreiſe
Leben nun auf ihre Weiſe.
Die Veränd'rung, ach, wie groß!
Liebe! Liebe! laß mich los!

Goethe.

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The following brief extracts are taken from among several hundred favourable reviews of Prof. Buchheim's Poetical Selections:—

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ASSISTANT MASTER AT WESTMINSTER SCHOOL

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PREFACE

THIS small Dictionary has been prepared at the request of Messrs. MACMILLAN AND CO., and is primarily intended to meet the needs of young pupils. Several excellent Latin-English Dictionaries are already in use in our schools, well adapted to the requirements of Middle and Upper Forms. The publishers believe that there is a demand for a Dictionary which does not attempt to compete with these, but is modelled rather on the lines of a simple Vocabulary.

Practical experience proves that numerous examples and quotations, though valuable and necessary for older or more advanced pupils, bewilder rather than help the youthful beginner. For this reason in many schools Dictionaries have been altogether discarded in the Lower Forms, and the pupils use editions supplied with a special Vocabulary.

I should have wished not only to cut down the examples, but to still further simplify the book by omitting all save the most elementary derivations; but to do this, I am told, would impair its value in the eyes of many teachers. I have therefore inserted the usually received etymologies, except where they are too doubtful or obscure to be of any value.

The number of authors read in "Easy Selections" has increased so much in recent years, that it has been a difficult matter to decide what words to omit and what to include. I believe that the choice I have made will prove sufficient for the needs of those for whom the book is specially intended; indeed I think that I have erred rather in the direction of excess than of defect. I am not without hope that the Dictionary may be found useful in some cases for older boys, those on the modern side for instance, or those who are getting up a modicum of Latin for examination purposes.

The reduction in the quantity of matter has made it possible to print this book in exceptionally large and clear type, on good paper, and to issue it at a low price. An elementary school book is not a joy for ever to its possessor, and I trust that the cheapness of this little work will enable many a boy to consign his copy with a light heart to the flames, before it has reached a wizened and unsightly old age.

In preparing the book I have made free use of the labours of my predecessors. I refrain from enumerating them, not from any desire to conceal the extent of my obligation, but lest the length of the list should seem out of proportion to the modest and unpretentious character of the resulting work. For any notes of errors or omissions, which should be addressed to me direct or to the publishers, I shall be grateful.

PREPARATORY SCHOOLS' REVIEW.—"A capital book for use in Preparatory Schools. . . . The book is quite the cheapest Latin Dictionary which can claim to be at all satisfactory; and it is very doubtful whether anything will be lost by the omission of more copious instances, which, useful as they are to an older hand, are mostly wasted on, and even bewilder, the Preparatory School boy."

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out money. 2. (meton.) *ownership, possession, property.* 3. (fig.) *a slave purchased by mancipium;* in gen. *a slave.*

mancĭpo (mancŭpo), āre, āvi, ātum, *tr.v.* [manceps], *make over property* by mancipium, *sell, transfer.*

mancus, a, um, *adj.* 1. *maimed, infirm.* 2. *defective, imperfect.*

mandātum, i, *n.* [mando], *charge, order, commission, command.*

mandātus, ūs, *m.* [id.] (only in abl. s.), *command, mandate,* Cic.

Mandēla, ae, *f.*, town in Samnium.

1. **mando**, āre, āvi, ātum, *tr.v.* [manus, do]. 1. *commit to one's charge, commission, enjoin, command.* 2. *consign, entrust;* se fugae, *take to flight,* Caes.

2. **mando**, ĕre, di, sum, *tr.v.* [madeo, prop. *moisten*]. 1. *chew, masticate.* 2. *eat, devour;* humum, *bite the ground,* Verg.

Mandubĭi, ōrum, *m. pl.*, a Gallic people, whose chief town was Alesia.

mānē [Old Lat. manus, *good*, cf. Manes]. I. *subst. indecl. n., the morning, morn.* II. *adv., in the morning.*

mănĕo, ēre, nsi, nsum, *v.* [cf. *μένω*]. A. *intr., stay, remain, abide, continue, last.* B. *tr., wait for, await.*

Mānes (mānes), ĭum, *m. pl.* [Old Lat. manus = *good*]. I. *deified souls of the dead; the gods of Lower World; ghosts, shades.* II. 1. *the Lower World.* 2. *punishments of the Lower World,* our '*Hell*,' quisque suos patimur manes, Verg. 3. *corpse.*

mango, ōnis, *m.* [*μάγγανον*], *slave-dealer,* Hor.

mănĭbrĭum, see **manubrium.**

mănĭcae, ārum, *f. pl.* [manus]. 1. *long sleeves* of tunic reaching to hand, serving as glove. 2. *glove* or *muff.* 3. (meton.) *handcuffs, manacles,* Verg.

mănĭcātus, a, um, *adj.* [manicae], *furnished with long sleeves,* Cic.

mănĭfestē (-festō), *adv.* [manifestus], *clearly, evidently.* *Comp.* manifestius.

mănĭfesto, āre, āvi, ātum, *tr.v.* [id.], *show clearly, exhibit, manifest.*

mănĭfestus (mănŭfestus), a, um, *adj.* [manus; fendo, cf. defendo]. 1. *clear, plain, evident, manifest.* 2. *brought to light, proved* by direct evidence. 3. *manifestly betraying, convicted of,* with gen.

mănĭprĕtĭum, see **manupretium.**

mănĭpŭlāris (sync. **mănĭplāris, mănŭp-**), e, *adj.* [manipulus], *belonging to a maniple;* iudices, *jurymen who once were common soldiers,* Cic. **mănĭpŭlāris**, is, *m.* 1. *a member of a maniple, private.* 2. *member of the same maniple, comrade.*

mănĭpŭlātim, *adv.* [manipulus], *by maniples,* Liv.

mănĭpŭlus (sync. poet. **mănĭplus**), i, *m.* [manus, pleo]. 1. *a handful; bundle* of hay, etc. 2. (milit. t.t.) *a company* of soldiers, *a maniple,* because, it is said, in old days a pole with handful of straw or hay twisted about it served as a standard.

Manlĭus, a, the name of a R. gens. **Manlĭus (Manlĭānus)**, a, um, *adj.*

mannus, i, *m.* [Celtic word], *cob, nag.*

măno, āre, āvi, ātum, *v.* [cf. madeo]. A. *intr.* 1. *trickle, flow, drop, distil.* 2. (meton.) *spread, be diffused.* 3. (of rumour, etc.) *spread abroad.* 4. *arise, proceed.* 5. *escape, be forgotten,* de pectore, Hor. B. *tr., cause to flow, shed, distil.*

mansĭo, ōnis, *f.* [maneo], *a staying.*

mansŭē-făcio, făcĕre, fēci, factum (pass. **mansŭē-fĭo**, fĭĕri, factus), *tr.v.* [mansuetus, facio]. 1. *tame.* 2. (fig.) *pacify, civilise.*

mansŭesco, ĕre, sŭēvi, sŭētum, *v.* [manus, suesco, *accustom to the hand*]. A. *tr., tame.* B. *intr., grow tame, gentle,* or *softened.* **mansŭētus**, see below.

mansŭētē, *adv.* [mansuetus], *gently, mildly, calmly.*

mansŭētūdo, ĭnis, *f.* [id.], *mildness, gentleness, clemency.*

mansŭētus, a, um, *p.p.* of mansuesco; as *adj.* 1. *tame.* 2. *mild, gentle, calm.* *Comp.* mansuetior, *sup.* mansuetissimus.

mansus, *p.p.* of 1. mando, 2. maneo.

mantēle, is, and **mantēlĭum**, ĭi (**mantĭ-**), *n.* [manus, tela], *towel, napkin,* Verg.

mantĭca, ae, *f.* [manus], *bag, portmanteau, wallet.*

Mantō, ūs, *f.* 1. prophetess, dr. of Tiresias. 2. Italian prophetic nymph, founder of Mantua.

Mantŭa, ae, *f.*, city of Gallia Transpadana, near which was Andes, birthplace of Vergil.

mănŭbĭae, ārum, *f. pl.* [manus], *money obtained from the sale of booty.*

mănŭbrĭum (mănĭbrĭum), ĭi, *n.* [manus], *handle, hilt, haft.*

mănŭfestus, see **manifestus.**

mănŭmissĭo, ōnis, *f.* [manumitto], *the freeing of a slave, manumission.*

mănŭmitto or **mănŭ mitto**, ĕre, mīsi, missum, *tr.v.* [manus, mitto], *set at liberty, emancipate, free* a slave.

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a maker, of anything. Crĕātor, condĭtor, auctor, artĭfex -icis, fābrĭcātor, effector, mōlĭtor.—Of a law, lātor.
the right or power of making. Factio.
maladministration.——Men guilty of maladministration. Male rem gerentes. Cic. (This refers to their private affairs; of affairs of state he would have said, rempublicam.)——There was as much maladministration of the affairs of war as in those of peace. Nihilo militiæ quam domi melius respublica administrata est. Liv.
malady. Morbus.—*See* sickness.
malapert. Pĕtŭlans.——**malapertly.** Pĕtŭlanter.
malapertness. Pĕtŭlantia.
malcontent.—*See* discontented.
male. Mascŭlus, mas, *gen.* măris.——While male descendants of king Ancus remained. Anci regis virile stirpe salvâ. Liv.
malediction. Exsĕcrātio.
malefaction. Crīmen -ĭnis, *neut.*; mălĕfĭcium.—*See* crime.
a malefactor. Mălĕfĭcus, *adj.*; *comp.* -centior, &c.
malevolence, malice, malignity. Mălĕvŏlentia, mălignĭtas.
malevolent, malicious, malignant. Mălĕvŏlus, *comp.* -entior, mălignus.
malevolently, maliciously, malignantly. Mălignē.
malformation. Dĕformĭtas.
malleable. Ductĭlis. Plin.
a mallet. Malleus.
a mallow. Malva.
malpractice, malversation.—*See* maladministration, peculation.
a man, a human being, not a beast. Hŏmo -inis;—not a woman, vir, vĭri. (Sometimes the two are used together: vir, as one worthy to be called a man, being opposed to homo, as a contemptible fellow.)—A young man, jŭvĕnis, ădŏlescens.—An old man, sĕnex.—Man, as applied to ship, in such expressions as man-of-war (*see* ship).——You are not a man to boast. Non is es qui gloriere. Cic.
mankind.——Fellowship with mankind. Societas generis humani. Cic. ——All mankind. Omnes mortales omnium generum (Cic.); omnes qui ubique sunt. Cic.
to man (as the crew mans a ship). Conscendo, 3 (*see* to embark); as a captain mans it.——Domitius requires certain ships, and mans them with husbandmen and shepherds. Certas sibi deposcit naves, Domitius, atque has colonis pastoribusque complet. Cæs.
to manacle. Vincio, 4.—In vincula conjicio. Liv.—In catenas conjicio. Cæs.
manacled. Vinctus, *cătēnātus.
manacles, in *pl.* Vincŭla, *sync.* vîncla, cătēnæ, *mănĭcæ.—*See* chain, prison.
to manage affairs. Gĕro, 3; admĭnistro, 1; cūro, 1.—Affairs, or living beings, tracto, 1; *i. e.* to govern, *q. v.*, rĕgo, 3.—Animals, dŏmo, 1.
management of affairs. Admĭnistrātio, cūrātio, dispensātio.— Of living beings, tractātio.—Good management, prūdentia, dextĕrĭtas.
manageable. Tractābĭlis, făcĭlis.—Of animals, &c., dŏmābĭlis.
a manager. Admĭnistrator, cūrātor, dispensātor, mŏdĕrātor, *fem.* moderatrix.—Of animals, dŏmĭtor, *fem.* dŏmĭtrix.
a mandate. Mandātum, jussum, ēdictum.—*See* command.
mandible. Maxilla.
mandrake. Mandrăgŏras -æ, *masc.* Plin.
mane. Jŭba.
with a mane. Jŭbātus.
maneater. Anthrōpŏphăgus.
manes. Mānes -ium, *pl. masc.*
manful, manly. Vĭrīlis; *i. e.* vigorous, bold, *q. v.*, fortis, strenus.
manfully. Vĭrīlĭter, fortĭter, strēnue.
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frŭtĭcor, āris. *v. dep.* To be bushy, to sprout up in bushes.
frŭtĭcōsus, a, um. *adj.* Bushy, shrubby.
frux, frūgis. *f.*; very rare in sing. 1. The fruits of the earth (esp. green fruit, or that which grows in pods, leguminous fruit). 2. Fruit, i. e. result, consequence (rare): expertia frugis, works without any stuff in them, worthless, Hor.; fruge Cleantheâ, with the doctrine of Cleanthes, Pers.; multos vidi ... qui totam adolescentiam voluptatibus dedissent emersisse aliquando et se ad frugem bonam, ut dicitur, recepisse, I have seen many men, who had devoted their whole youth to dissipation, at last emerge, and come to bear a good crop, as the proverb is (i. e. reform), Cic.; herus si tuus volet facere frugem, if your master wishes to act with advantage, Plaut. — See **frugi.**
fūcātus, a, um. *part.* from fuco, q. v.; also as *adj.* Counterfeit, fictitious.
fūco, as. *v. a.* To paint, to die, to colour (esp. a face with rouge).
fūcōsus, a, um. *adj.* Counterfeit, spurious, deceptive.
fūcus, i. *m.* 1. ‡Rock lichen used for a red dye or for rouge. 2. A red colour, a red dye, rouge. 3. Any paint or colour. 4. Pretence, disguise, deceit. 5. Bee glue, with which bees stop up the entrance to the hive, propolis: fucum facio (c. dat. pers.), to deceive, Cic.
fūcus, i. *m.* A drone.
fŭga, æ. *f.* 1. Flight. 2. §A swift progress. 3. Banishment, exile. 4. Avoidance, desire to avoid, disinclination to. Facio fugam, *both* to put to flight *and* to take to flight: cum fugam in regiam fecisset, when he had made every one flee into the palace, Liv.; consternatæ cohortes fugam fecerunt, the squadrons in consternation took to flight, Liv.
fŭgācĭter. *adv.* By fleeing, by retiring.
fŭgax, ācis. *adj.* 1. Inclined to flee, to run away. 2. Timid, coy (of a damsel). 3. Fleeing quickly, swift. 4. §Eager to avoid (c. gen.). 5. Fleeting, transitory.
fŭgiens, entis. *part.* of seq., used also as *adj.* 1. Growing flat, losing its strength (of urine). 2. Departing, dying. 3. Desirous to avoid (c. gen.).
fŭgio, ĭs, fūgi, fŭgitum. *v. n.* and *a.* 1. (*v. n.*). To flee, to run away. 2. To pass away, to disappear. 3. (*v. a.*). To flee from, to avoid, to shun (c. acc., very rarely c. **ab** and *abl.*). 4. To be banished from (c. acc., once in Quint. c. **de** and abl.). 5. To escape from, to escape. 6. To escape the notice, or the memory of: fugit me ad te antea scribere, I forgot to write to you before, Cic.
fŭgĭtīvus, a, um. *adj.* Running away, fugitive. (Usu. in *m.*, as *subst.*). 1. A runaway, a runaway slave. 2. A deserter.
†fŭgĭto, as. *v. n.* and *a.* 1. (*v. n.*) To flee. 2. (*v. a.*) To avoid, to shun.
†fŭgĭtor, oris. *m.* A runaway.
fŭgo, as. *v. a.* 1. To put to flight, to drive away, to rout. 2. To send into banishment, to be the cause of banishment to, to banish.
§fŭlcīmen, ĭnis. *n.* A prop, a support.
fulcio, īs, si, tum. *v. a.* 1. To prop up, to support. 2. To strengthen, to secure. 3. (Metaph.) To support, to sustain (a friend in distress, etc.), to be the stay of. Antiopa ærumnis fulta, Antiopa oppressed with sorrows, Prop.
fulcrum, i. *n.* 1. A prop, a support (esp. the foot or pillar on which a bed stands). 2. A bed.
fulgeo, es, si, infin. also **fulgĕre,** no sup., *v. n.* To shine, to beam, to glitter, to glisten.
†fulgĭdus, a, um. *adj.* Shining, glittering, bright.
fulgor, ōris. *m.* 1. Sheen, brightness, brilliancy. 2. Lightning. 3. Splendour, brilliancy (of reputation, etc.).
fulgur, ŭris. *n.* 1. Lightning. 2. §A thunderbolt. 3. ‡A thing struck by lightning. 4. †§Brightness, brilliancy.
fulgŭrālis, e. Relating to lightning, or to the way of averting or interpreting omens given by lightning.

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SECTION 1.

First Declension: Singular.

Learn:—

Nominative case,	Mensă	*a table.*
Accusative case,	Mensam	*a table.*
Genitive case,	Mensae	*of a table* (or) *a table's.*
Dative case,	Mensae	*to* (or) *for a table.*
Ablative case,	Mensā	*by, with,* (or) *from a table.*

Write down in the same way:—

vīta, *life.* fĕnestra, *a window.*

cŏlōnia, *the colony.*

SECTION 2.

The Accusative Case.

We say in English "I strike *him*," not "I strike *he*," and "He strikes *me*," not "He strikes *I*;" for in these sentences the persons who strike are put in the nominative, and the persons whom they strike in the accusative. But very few words in English, as it is spoken and written nowadays,[1] have an accusative case different from the nominative. We say, for instance, "The stone struck me" and "I struck the stone," and the word

[1] English used to be more like Latin in this respect; for instance, "tunge" (now "tongue") used to have an accusative "tungan."

queen. 2. The unhappy man loves the beautiful girl. 3. The good girl often gives books to the unhappy queen. 4. The queen praises the girl's beautiful books. 5. The slaves praise the beautiful table of *their* masters. 6. The unhappy girl loves the good queen. 7. The queen often gives beautiful roses to the unhappy girl. 8. The good girls love the unhappy queen. 9. The masters give many letters to *their* slaves. 10. The queen always praises the good girl's diligence.

SECTION 10.

EST—SUNT.

Est, *is:* sunt, *are.*

The Latin for "Julia is queen" is *Julia est regina* (not *reginam*). The rule that the accusative is to be put after the verb does not apply to the verb "to be."

It is not right to say in English, "It is *me*," and "It is *him*," but "It is *I*," and "it is *he*." So in Latin, *est Julia* (not *Juliam*) will stand for "It is Julia."

Be careful, too, to notice that the adjective has to agree with its noun none the less because *est* or *sunt* comes between them. So the Latin for "the rose is beautiful" is *rosa est pulchra.*

[22.] 1. Puer est miser. 2. Epistula est longa. 3. Puellae sunt pulchrae. 4. Arma pulchra sunt. 5. Vir bonus non est miser. 6. Libri amico meo grati sunt. 7. Mensa magistri plena librorum est. 8. Magister Juliam laudat, Corneliam culpat. 9. Horti pulchri pueris et puellis grati sunt. 10. Epistula reginae bonis puellis grata est. 11. Hortus reginae semper plenus rosarum est. 12. Magister pigros pueros culpat, impigros laudat. 13. Magister pueris praemium non dat; non sunt boni. 14. Longa Marci epistula puellae

Cyclōpes eorum nomen erat. Haec res Ulixi non nota est. Ulixes igitur et comites ejus ad specum Polyphēmi veniunt. Is ferocissimus omnium Cyclopum est, idemque ceteris corpore ingentior: unum modo oculum in media fronte habet. In specu, igitur, Graeci lac et caseos laeti inveniunt. Ipse autem non adest, sed oves in montibus pascit. Brevi tempore ipse Polyphemus ad specum cum ovibus revertit. Primum maximo atque gravissimo saxo januam specus claudit. Deinde oves mulget, et lignis ignem facit. Tum demum Ulixem duodecimque ejus comites conspicit.

(*Continued on p.* 81.)

Recapitulatory Exercises.

E. 1. Hic filium, ille servum, ad urbem mittit. 2. Rex mercatorem laudat, eique magnam reginae imaginem dat. 3. Quintus tibi notus est: is omnium amicorum mihi longe carissimus est. 4. Ubi est illa domus, quam tuus pater in hac urbe aedificat? 5. Legati, quos hostes mittunt, jam in castris sunt. 6. Magister pueros laudat, eisque libros dat. 7. Regi et reginae eadem virtus eadem sapientia fuit. 8. Hi pueri se pessimis amicis semper circumdant. 9. Rex ad castra hostium copias ducit, agrosque eorum vastat. 10. Uter fratrum major est? — Alexander non solum natu major, sed multo etiam sapientior, est.

F. 1. The king himself informs me of these matters. 2. This legion has three thousand soldiers. 3. The best part of us is not the body, but the mind. 4. The ambassadors were three miles from the camp. 5. The works of Cicero are neither very difficult nor very easy. 6. Girls and boys are often not pleased by the same things. 7. I am to-day twenty-one years old. 8. The courage of the seventh legion is often praised by Caesar.

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EXTRACT FROM PREFACE

"It will be well with the issue of the Second Part of this series to state once again what our aims are, and by what method we hope to attain them.

We aim at making the first few steps of the student at once more easy to take and more productive of permanent result. It seems to us that it is possible, by following in some respects the method which a child pursues in learning its native language, to make the process of learning Latin easier. A child, for example, uses the little stock of words already acquired over and over again, and only adds a word or two each day. In the same way we endeavour to make the increase of the vocabulary steady but gradual, so that the student will know or half-know nine-tenths of the words in each exercise, and will have to do comparatively little dictionary work (which is dull), but will be occupied rather in manipulating familiar words (which is interesting). Again, just as a child picks up the various ways in which sentences are put together, not so much from explanation as from hearing numberless examples, so we try by constant iteration to accustom the student to the Latin constructions. Of course, when these differ from the English constructions a few words of explanation are necessary, but a few words will generally suffice; it is not desirable at this

stage to attempt to classify the constructions or in any way to pursue the study of grammar. It is these constructions which make Latin a very difficult language to read; when once the inflexions have been mastered the vocabulary puts no considerable strain on an English memory; but it requires a prolonged effort to get accustomed to the various uses of the infinitive and subjunctive and participles which have no counterpart in our own language. When the student feels at home with such sentences as *Rogavit quis vicisset* and *Renuntiavit eum, qui vicisset, iam adesse*, so that he is not forced to stop and translate them to himself, he will soon be able to read continuous passages with ease. Our chief object in this volume is to accustom him to such sentences.

The pieces of translation necessarily contain a large proportion of unfamiliar words: they are introduced less with a view to systematic teaching, than in the hope that, being naturally more interesting than detached sentences, they may prove at least a not unprofitable diversion. With many pupils it would certainly be wiser to omit them in first going through the book or to give a good deal of help; otherwise more time and labour will be spent in turning the leaves of the dictionary than would be advisable.

This book is an abridgment of the second part of the longer course. The longer course carries out more fully the principles on which the series is based: but many teachers cannot find the time to use a larger book, and are forced to carry their pupils over the elementary ground more quickly. We have aimed at making this book as serviceable as possible to such students. The points most fully illustrated are the following: the use of the participles, the accusative and infinitive, the indirect question *ut*, *ne*, *cum*, *qui* final, *quin*, conditional sentences, continuous oratio obliqua. The exercises have been to a great extent rewritten to suit the requirements of the smaller book.

A. M. C.

W. E. P. P.

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PRESS OPINIONS

Guardian.—"English schoolmasters are more likely to be attracted by Messrs. Cook and Pantin's *Shorter Latin Course*, Part II.—an abridgment of a longer course by the same authors which appeared two years ago. It seems to us extremely well done."

School Guardian.—"This is an admirable book for teaching young pupils the first principles of Latin construction. By attempting to follow the method which a child pursues in learning its own language, the editors here have considerably improved upon older books. The pieces for translation may, perhaps, be somewhat beyond the powers of a boy able to do the exercises; but a book like this deserves to be gone over time after time until the whole is thoroughly learnt."

Educational Review.—"This will be found a useful book. . . . A short, and generally very clear, summary of the rules is given with a large number of exercises on them, and the book is interspersed with pieces for translation. The sections on 'oratio obliqua' are specially good."

School Board Chronicle.—"Macmillan's *Shorter Latin Course*, Part Second, is a worthy sequel to Part First, but abridged and rendered more intelligible to young students. . . . The points that are most usefully and fully illustrated are those precisely most wanted. . . . It is a most serviceable book, and as such we highly recommend it."

Schoolmaster.—"We regard this as a useful and practical elementary Latin text-book; a judicious mixture of accidence, syntax, vocabularies, reading lessons, and notes. It makes the subject about as interesting and instructive as it could well be made, and young students using it with a good teacher should make sound and satisfactory progress."

Educational Gazette.—"To students who have made some progress with the Latin Grammar, and who are seeking a useful, practical guide in Latin Composition, we recommend this book as one of the most useful they can adopt. . . . To anyone who carefully goes through the series of exercises contained in the book we can guarantee a knowledge of Latin sufficient for such examinations as that of the First Arts at the Royal University."

Glasgow Herald—"A handy abridgment of the larger work. The exercises take the student over the verbs and the dependent sentences, and illustrate copiously all the more important rules of syntax. The pieces for translation are for the most part interesting stories. The book on the whole is remarkably well adapted for teaching purposes."

hostes fuga salutem petiisse. 10. Ii se suaque[1] omnia nobis dediderunt.

[6.] 1. Caesar carried on war with all the tribes of Gaul. 2. The soldiers of the fifth legion have been sent to the Parisii. 3. The Romans knew the men who were asking for peace. 4. The Romans carried on war in the territory of the Germans. 5. The soldiers who stood in front of the camp saw the horsemen. 6. The barbarians set sail at midnight. 7. The soldiers of that legion will turn[2] and seek safety in flight. 8. The Roman leader restored all their hostages to the Haedui. 9. Money is now being paid; peace has been made: hostages have been given. 10. I will write a letter to him: he will not maintain his opinion.

I.

The Philosopher.

Philosophus quidam tantum libris deditus est ut cetera omnia prorsus ignoraret. Viso puero quodam, dum in via ambulat, quaesivisse dicitur: "Tu, parve puer, quod tibi nomen?" Respondit puer: "At, mi pater, filius tuus ego sum, nomine Octavus."

The Barber.

Iam barbam cuiusdam raserat tonsor quaesiveratque num quid eorum quae in tonstrina essent desideraret; unguentorum enim atque optimorum quidem copiam esse maximam. Negavit tamen ille sibi quidquam opus esse, rogavitque: "Quantum tibi me dare oportet?" "Da modo, domine," inquit, "quidquid soles ei qui

[1] *Suaque* = *sua* + *que*.

[2] He turns (*i.e.* he turns *himself* round) must be *se vertit*: *verto* is a transitive verb, that is to say, it must be accompanied by an accusative case.

SECTION 44.

CONDITIONAL SENTENCES—(*Continued*).

Before doing the two following exercises note the difference between—

1. Si adsit, eum laudemus (present subjunctive), *If he were to come* (in the future) *we should praise him*, and
2. Si adesset, eum laudaremus (imperfect subjunctive), *If he were here* (now) *we should be praising him.* (It is implied that he is not here.)

[124.] 1. Si rex essem, tibi non parcerem. 2. Si imperator fiam, Haeduos facile vincam. 3. Si ad regem adire auderem, ei persuaderem ut filium tuum liberaret. 4. Nisi canem timeret, non abiret. 5. Si mihi duo talenta des, de his rebus certiorem te faciam. 6. Si mihi duae essent legiones, Galli nobis nocere non possent. 7. Si negotio se dedat, ceteris facile praestet. 8. Si mos esset nobis ut victis parceremus, vitam vobis concederem. 9. Si liceat nobis abire liberis, e vestris finibus abeamus, nec quisquam nostrum redeat: aliquantum auri, frumenti multum ad vestram urbem quotannis mittamus. 10. Etiamsi vobis credere possem, non liceret mihi more populi Romani vobis parcere.

[125.] 1. If he were to come, I should not speak with him. 2. If he were present, I should say the same. 3. If he were to ask me, I should say that the legions ought to cross the river. 4. If he were to say it, I should not advise you to believe him. 5. If Caesar were to come with a fleet of a hundred ships, we would give up the city to him. 6. If I were in command of the cavalry, I should not fear Ariovistus, the king of the Germans. 7. If he understood this he would not

MACMILLAN'S
LATIN COURSE
IN THREE PARTS

BY

A. M. COOK, M.A.

AND

W. E. P. PANTIN, M.A.

ASSISTANT MASTERS IN ST. PAUL'S SCHOOL

London

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MACMILLAN'S LATIN COURSE

FIRST PART

BY

A. M. COOK M.A.

ASSISTANT MASTER IN ST. PAUL'S SCHOOL

EXTRACT FROM PREFACE TO THE FIRST EDITION

THE preparation of this book was undertaken from a conviction that the books of the kind now in use err in three not unimportant points—1. The exercises in each chapter are not sufficient in amount. 2. Too many words are introduced at once. 3. More rules are given than are required, and more explanation than is helpful.

In the present book, therefore, the *Exercises* are far more abundant than is usual. The *Vocabularies* are kept as small as possible, and consist of rarely more than six words, and often of less; and with the help of the recapitulatory exercises, a word once introduced is kept before the pupil through the rest of the book. No more *Rules* are given than are considered indispensable. It is hoped that this method will render the first steps in Latin easier and more sure.

It is suggested that the English exercises should be first read aloud by the pupil, that they should be read and re-read, and not written out until he is able to translate them into Latin with some fluency.

SUMMARY OF CONTENTS

THE book is divided into 108 sections, containing in all 324 exercises, many of which are recapitulatory. The subjects handled are the Declensions, Adjectives, Numbers, Pronouns, the verb *Sum*, and the four conjugations (excluding however the subjunctive mood). The exercises are followed by the full conjugation of the verbs, vocabularies to the exercises, Latin-English and English-Latin Dictionaries. It should also be mentioned that pieces of translation are inserted among the exercises at intervals, and thus the book, as far as it goes, is at once exercise-book, grammar, and reading-book.

PRESS OPINIONS

Literary World.—"This work, which is a praiseworthy attempt to make the difficulties of Latin easier at the beginning, deserves a little more notice than the many unsystematic books of exercises which seem to be the delight of publishers and the despair of schoolmasters. It proceeds on a definite plan, and that plan, we venture to think, is the most satisfactory, if not the only satisfactory one. Mr. Prendergast, in his valuable work on the mastery of languages, laid down the principles that are here followed out. The main features of the system are: (1) To begin the teaching of a language with the sentence as the unit, and not with the single word; (2) To limit the vocabulary; (3) To ensure a constant repetition of the words that make up this vocabulary; and, above all, (4) To dispense to a great extent with rules. Little children, it is argued, in a foreign country pick up a foreign language with notorious ease, because (1) they only learn a small number of words, (2 they are constantly repeating this small number. It is possible to imitate in the schoolroom the methods which the children thus unconsciously use. But, to do this, we must have exercises which are constantly dwelling on the same words, or on a vocabulary which increases by very small degrees. There are other books to a great extent constructed on these lines, but in these, valuable as they are, the exercises, as they advance, become rapidly too difficult, introduce far too great a number of words, and far too intricate constructions. Mr. Cook's work, we think, avoids the mistake there made; it contains three hundred exercises on a small number of words; it deals only with elementary accidence, and also it introduces from the first some Latin stories, which are at once easy, ingenious, and amusing. The intention of the book is that the exercises should be first read over by the master, that then they should be read by the pupils, and that the oral repetition should be continued. It is carrying into effect one great maxim of education—*répétez sans cesse.* Any master who goes through this book, *insisting on the oral rehearsal of these exercises*, will find that in a year pupils of ordinary ability will have mastered the first and most serious difficulties of Latin."

Schoolmaster.—"There are some excellent features in this work. The exercises are numerous; the same words crop up from time to time, and in different relations throughout the exercises; and easy and interesting narratives are introduced at a much earlier stage than usual. We have been greatly pleased with the preparation and arrangement of the work. . . . It is the very book to put in the hands of young beginners in Latin, and even they will find the exercises by no means dull, but even interesting work."

Pall Mall Gazette.—"This book provides a very large and valuable body of well-arranged exercises of Latin into English and English into Latin. . . . A great and uncommon merit of the book is that the vocabularies are kept as small as possible, and consist of rarely more than six words, and often of less."

Liverpool Albion.—"This work is evidently a fruit or enlightened experience in the art of teaching. The lessons are ample in quantity, and admirably graduated."

SECTION 14.

THIRD DECLENSION—(*Continued*): THE STEM.

The nouns of the third declension which have been given so far have been declined by adding the case-endings to the nominative singular. But in order to decline the greater number of nouns of this declension it is necessary to know another case as well. Judex, a judge, for instance, is thus declined:—

	Singular.		*Plural.*
Nom.	Judex.	Nom.	judices.
Acc.	Judĭcem.	Acc.	judices.
Gen.	Judicis.	Gen.	judicum.
Dat.	Judici.	Dat.	judicibus.
Abl.	Judice.	Abl.	judicibus.

It is not to *judex*, but to *judic-*, that the case-endings are added.[1]

(47.)

1. Militibus Germanis bellum gratum est.
2. Regina diligentiam militum laudat.
3. Soror parvo fratri bonum librum dat.
4. Fratres praemiis reginae contenti sunt.
5. Rex militibus hodie contentus est.

[1] English words derived from the Latin sometimes help one to remember how a Latin noun is declined; the word "military" reminds one that *miles* makes *militem*, etc., so "judicial," *judex, judicem:* "regal," *rex, regem:* "margin," *margo, marginem:* "capital," *caput, capitis;* and many others.

10. Nobis ipsis injuriae nostrae gravissimae videbantur.
11. Ille vir omnium sapientissimus haberi dicitur.
12. Hi viri jure optimo fortissimi habiti sunt.

(294.)

1. The boys were sitting every day in the garden.
2. That city was being besieged in vain.
3. Marcus now possesses his brother's books.
4. Caesar, you have been praised by all the citizens!
5. He has been judged the wisest of all.
6. Your little brother will have been frightened by the lightning.
7. Will you not be delighted with your elder son's diligence?
8. You will not, will you, be frightened by the spirited horse?
9. The sailors have been warned again and again.
10. Marcus has always been considered, and is, a very good citizen.

XXIV.

A Cork Leg.

Viator Britannicus, a fera quadam atque inculta gente captus, diu de salute sua desperabat. Tandem novum quidem et inauditum consilium capit. Cultrum enim primo in alterum crus (corticeum erat) ridens infixit: mirantur qui circumstabant barbari, et paululum recedunt. Deinde totum crus exuit, et minaci vultu manibus supra caput vibravit. Tum vero illi, maximo commoti timore, summa vi in pedes se dederunt.

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MACMILLAN'S
LATIN COURSE
SECOND PART

BY

A. M. COOK, M.A., AND W. E. P. PANTIN, M.A.

ASSISTANT MASTERS IN ST. PAUL'S SCHOOL

PREFACE

THE student of Latin has a threefold task to accomplish before he can read the Latin writers with any ease. In the first place, he must make himself familiar with the inflections. In the second place, he must acquire a considerable vocabulary. In both these respects Latin presents no serious difficulty; in both it is easier than Greek. The Greek irregular verb, with all its variety of forms for prose and poetry, taxes the strongest memory; the Latin irregular verb is easily acquired by any industrious student. With the vocabulary too there is much less labour involved; so many of the words wear a familiar aspect. But though the first two steps that have to be made by the student of Latin are not difficult, the third part of the task is by no means easy. The words taken singly are easily mastered, but it is nevertheless true that Latin is a peculiarly difficult language to read, that the relation of the words to one another is not easily detected without considerable practice. The reason of this is, no doubt, that many of the commonest Latin constructions have no counterpart in English. For example, in translating *Dixit se valere*, we cannot use our infinitive; we cannot imitate the construction of the sentence *Oravit me ut venirem*. Where Latin uses a participle we more often prefer a separate clause. It is not necessary to multiply instances to show that in the construction of sentences—and, we might add, in the order of words—the Latin language is peculiarly unlike our own. Hence Latin sentences seem strange and difficult to us; and this strangeness only wears off when we have got thoroughly accustomed to the Latin constructions.

Our principal object in the present volume is to introduce the beginner to the commonest Latin constructions, and, by continual practice, to make him quite familiar with them. Our plan is to explain the Latin usage in as few words as possible, avoiding as far as we can technical terms, to which the young student necessarily attaches no definite meaning. We then give at least one Latin and one English exercise dealing chiefly with the point explained, and in subsequent exercises we never leave it out of sight for long. We have endeavoured to present each construction only in its simplest form, occasionally suggesting in a note that there is more to learn. Many of the books most commonly put into the hands of beginners seem to us more difficult than they need be, because they give too much information, so that even the most intelligent boys are puzzled with a mass of details,

10. Nobis ipsis injuriae nostrae gravissimae videbantur.
11. Ille vir omnium sapientissimus haberi dicitur.
12. Hi viri jure optimo fortissimi habiti sunt.

(294.)

1. The boys were sitting every day in the garden.
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Gaius ?"

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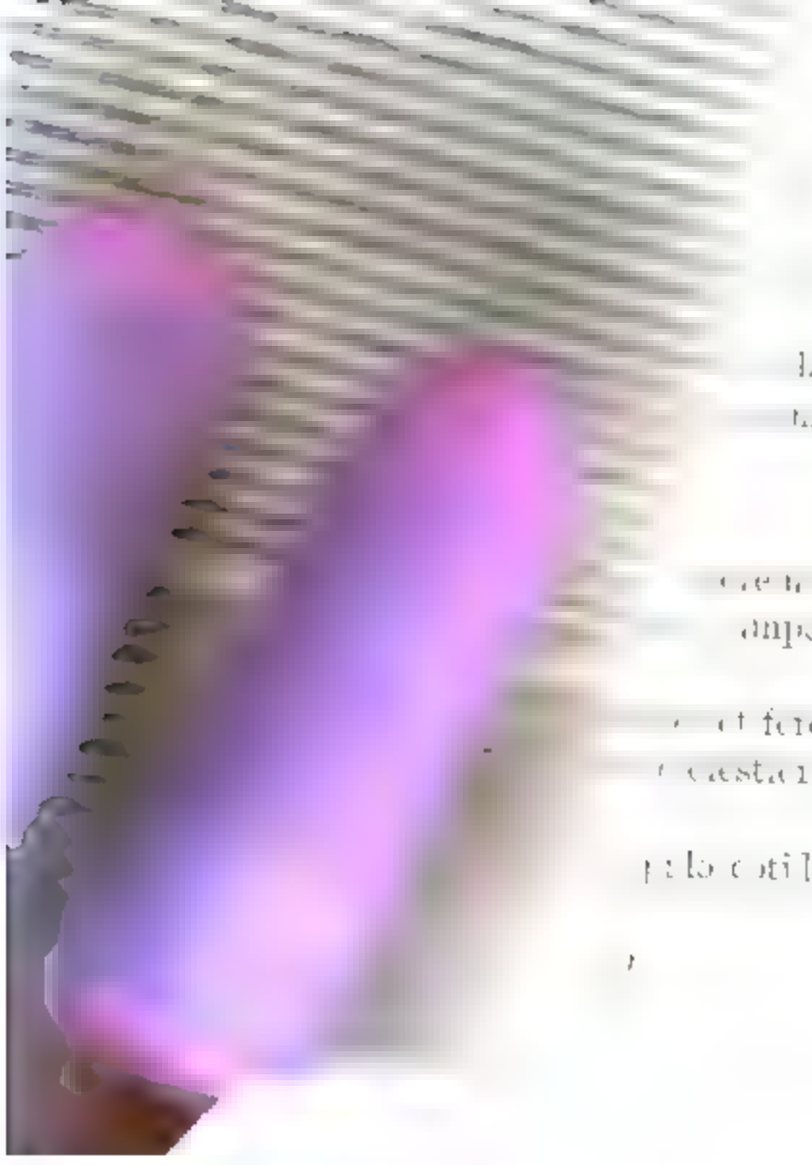

supine of *fero*

he passive of *facio*

factus sum

patienter ferre

impetum nostrorum

et feret ; vir fortis est.

Celestiores hunt ; plurimi

pulo cotidie factae sunt.

I hope that the book may prove useful not only for younger boys, but also for those elder boys and girls who begin Latin rather late and cannot give much time to the study of the language. For them the important thing is that they should acquire as rapidly as possible the power to read ordinary Latin prose without great difficulty. I think that something may be done to help them by excluding everything that is not quite common, and by giving plenty of practice in dealing with all those difficulties which are of frequent occurrence. It is waste of time to give them an exercise on *Macte virtute*, for example, or the use of the infinitive in rhetorical questions in Oratio obliqua, for they will very likely never come across an instance of either. What they need is such familiarity with common constructions as will make a sentence like the following easy and pleasant to read: *Cuius sermone ita tum cupide fruebar, quasi iam divinarem, id quod evenit, illo exstincto fore, unde discerem, neminem.*

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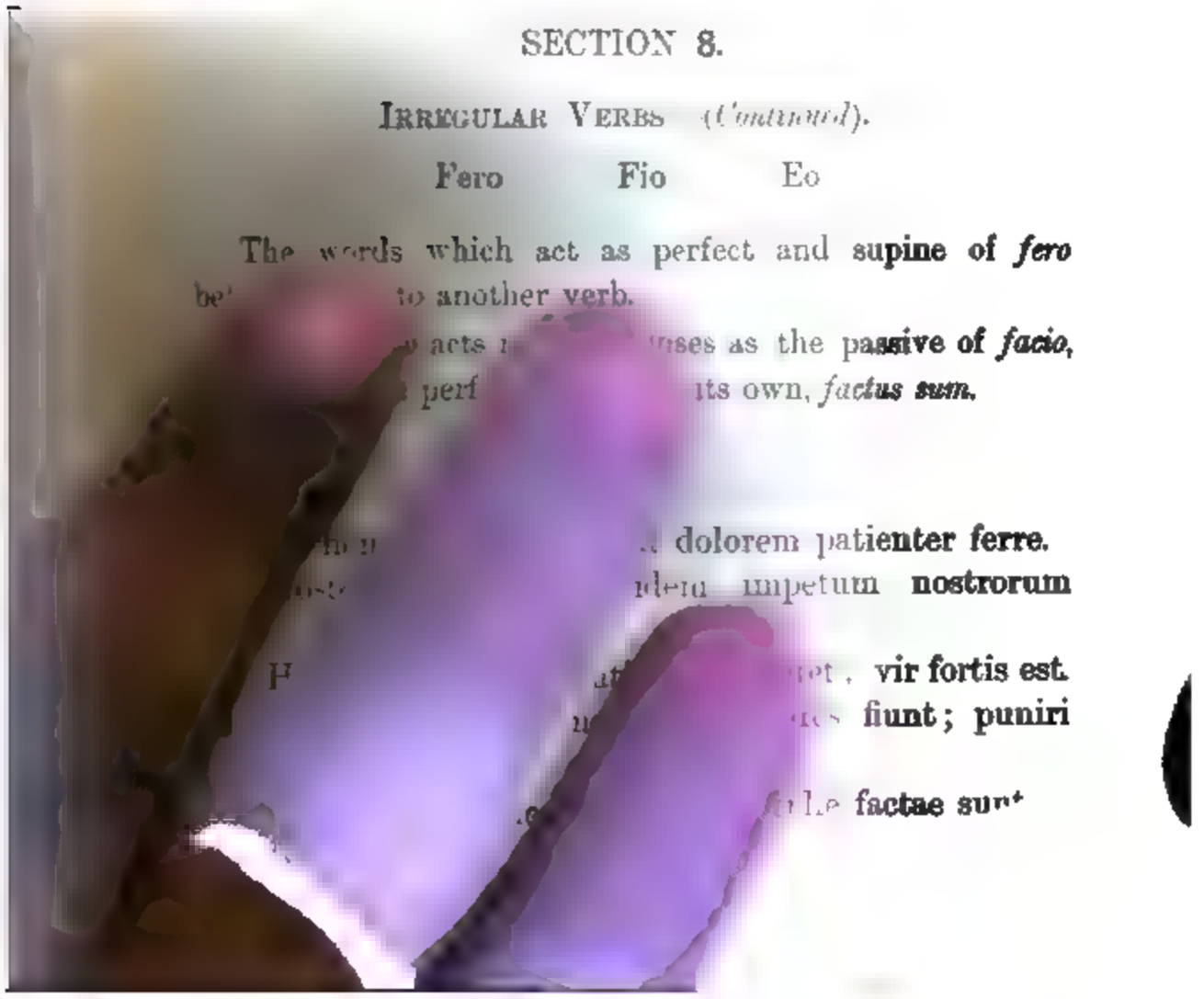
(Specimen Page, Second Part.)

8. Do not despise the poor: we ought to prefer wisdom to riches.
9. He will choose rather to go to the city than to remain at home.
10. He will neither be able nor willing to understand this book.
11. He inquired of me: "You have not seen Gaius?" "I have not seen him," I answered.
12. Do not, friends, blame the slave; he has been sufficiently punished already.



SECTION 8.

IRREGULAR VERBS (*Continued*).

Fero Fio Eo

The words which act as perfect and supine of *fero* be
to another verb.
acts
uses as the passive of *facio*,
perf
its own, *factus sum*.

dolorem patienter ferre.
idem impetum nostrorum
vir fortis est.
fiunt; puniri
factae sunt

Exercise 63

In the House of Lords

It seems to me, my lords, that you fail to understand that the question before you is, not whether we are to have peace or war, (for King Philip will not leave that open to you, he is setting about a great war both by land and sea,) but whether we are to carry our forces across to Spain or to receive the enemy into Britain. What an important difference this makes, you have certainly learned by your experience in the recent war, if never before. If Philip sends his soldiers over to Britain, do you believe that the Irish will keep quiet and maintain their loyalty to the throne? Never will that people fail to side against us, whenever they have any one, to

A question in the deliberative subjunctive suffers no change of mood when made indirect:

Direct — *Utrum cedamus an resistamus?* Are we to yield or resist?

Indirect—*Quaerit utrum cedamus an resistamus*, He asks whether we are to yield or resist.

my lords, *patres conscripti.*

fail to understand: use *ignorare.*

the question before you is: say 'you are being consulted.'

Philip, *Philippus.*

I leave it open to you, *liberum id vobis permitto.*

to set about a great war, *ingens bellum mōliri.*

to learn by experience, *experiri.*

recent: use *proximus.*

Irish, *Hiberni.*

maintain loyalty *to the throne, in fide manēre.*

never will that people etc.: arrange thus 'Never will that people, unless when there is wanting *one* to whom they may go over (*desciscĕre*), not revolt from us.' Here is a similar sentence: *Numquam ego, nisi cum deerunt quibus subveniam, non resistam tibi.*

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FIRST STEPS

TO

LATIN PROSE COMPOSITION

BY

REV. GEORGE RUST, M.A.

OF PEMBROKE COLLEGE, OXFORD

LATE MASTER OF THE MIDDLE AND LOWER SCHOOL, KING'S COLLEGE, LONDON

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Exercise I.

FIRST CONJUGATION.

Active Voice, Indicative Mood.

1. The boy was calling
2. The soldier fights
3. The javelin wounds
4. The king has praised
5. The spear had wounded
6. The father will call
7. The king will have fought
8. The soldier was fighting
9. The slave had called
10. The king is praising
11. The queen had praised
12. The father has called

Exercise XLII.

MISCELLANEOUS.

1. Cæsar orders the whole mountain to be fortified
2. Not having dared to cross the river the barbarians return into their camp
3. Cæsar understands that the Helvetii are about-to go through our province
4. The soldiers of the tenth legion having followed Cæsar in many battles said that they were willing to fight against Ariovistus
5. The journey from the hither province into further Gaul is long and difficult
6. The barbarians boast that they are able to conquer a Roman army
7. The same chiefs returned and said that they were willing to give hostages
8. Ariovistus said that he had left his own borders not without the hope of great rewards
9. On-account-of the multitude of the enemy our men did not dare to leave the camp
10. Having ravaged the lands of the Sequani the Germans returned to their own borders

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XXV.

MISCELLANEOUS EXERCISES ON THE ABLATIVE

1. On the top of the hill Cæsar had pitched his camp.
2. He had fortified it with a ditch and five castles.
3. The soldiers defended it with much valour against the Nervii.
4. Nothing can be more useful to a soldier than virtue.
5. This soldier is braver than that one, and Cæsar has praised him.
6. We all hope that Cæsar, relying on his valour, will conquer the Nervii.
7. The Nervii, coming by night, attacked Cæsar's camp.
8. Having defeated the Nervii, Cæsar followed them many miles.
9. Cæsar, having followed the Nervii many miles, slew a large number of them.
10. They have seen the king with his army near the banks of the Rhone.
11. When the king was dead, all the enemy fled across the Rhone.
12. Cicero was killed by the order of Marcus Antonius, the Triumvir.
13. Let us use wise counsel rather than arms in this matter.
14. They have declared that they will use violence.
15. Relying on his courage, he attacked the lion and slew him.
16. The lion was slain by the brave soldier with his sword.
17. We have taught you that counsel is better than violence.
18. The young prefer to use violence, the old, counsel.
19. He has returned from Capua, where he saw your father and sisters.
20. If my father and sisters are at Capua, I shall go away from Rome at once.

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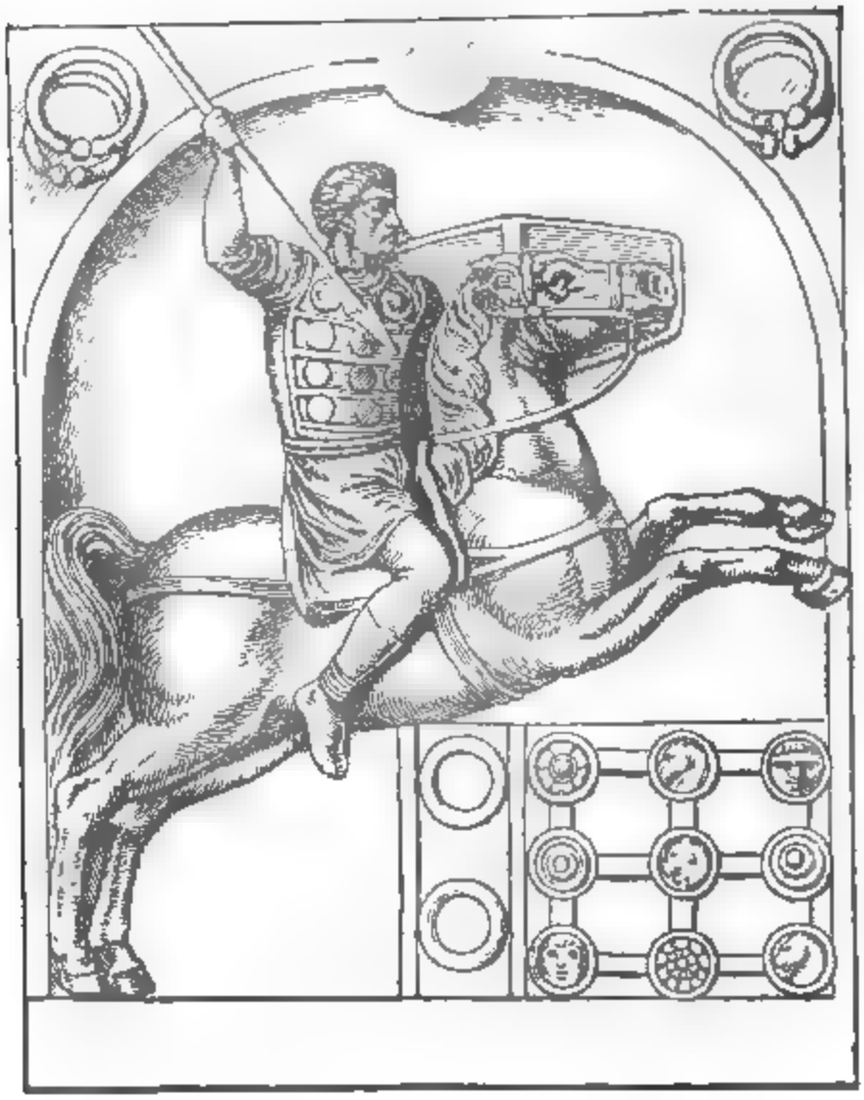

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3. We will not remain in the city without you.
4. I came with my friend.
5. The pirate does not fight without ships.
6. We remained many days in the city.

LESSON XIV.

The Ablative is used to express the means, instrument, manner, and cause of an action.

dīvid-o, -ere, dīvīs-i, dīvīs-um (v.a. 3) I divide.
glad-ius, -ii (m.), a sword. **am-or, -ōris (m.), love.**
auxil-ium, -ii (n.), help.

Exercise A.

1. Miles gladio hostem vulnerabat.
2. Navibus hostium victi sumus.
3. Agri duobus fluminibus dividuntur
4. Amore virtutis militem laudabimus.
5. Muris urbem munitote.
6. Hostes summa virtute pugnaverunt

Exercise B.

1. With a loud (*magnus*) voice he called the sailors.
2. With great bravery he avenged the wrongs of the king.
3. The soldiers were wounding the enemy with swords.

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27. Tum demum Liscus oratione Caesaris adductus, 'Sunt' inquit, 'nonnulli, quorum auctoritas apud plebem plurimum valet:

ii privatim plus possunt quam ipsi magistratus.

Hi seditiosâ atque improbâ oratione multitudinem deterrent, ne frumentum vobis conferant.

Dicunt satius esse, si jam principatum Galliae obtinere non possimus, Gallorum quam Romanorum imperia perferre:

neque se dubitare quin, si Helvetios superaveritis, una cum reliquâ Galliâ nobis libertatem sitis erepturi.

Hi vestra consilia, et ea, quae in castris geruntur, hostibus enuntiant: neque eos coercere possumus.

Intelligo quanto cum periculo haec tibi enuntiem, et ob eam causam, quam diu potui, tacui.'

28. Hac oratione Lisci Dumnorix, Divitiaci frater, designabatur: Caesar autem, pluribus praesentibus, eas res jactari nolebat: celeriter concilium dimittit, Liscum retinet.

Quaerit ex solo ea, quae in conventu dixerat.

Dicit liberius atque audacius.

Eadem secreto ab aliis quaerit: repperit esse vera.

ex eo audit Dumnorigem esse summâ audaciâ hominem:

illum propter liberalitatem magnâ apud plebem gratiâ esse:

novarum rerum cupidum esse.

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receperunt. Eodem die legati ab hostibus missi ad Caesarem de pace venerunt. 28. His Caesar numerum obsidum, quem antea imperaverat, duplicavit: eosque in continentem adduci jussit. Ipse, idoneam tempestatem nactus, paulo post mediam noctem naves solvit: quae omnes incolumes ad continentem pervenerunt: sed ex iis onerariae duae portus capere non potuerunt, et paulo infra delatae sunt.

The Britons surrender, and Caesar returns to Gaul.

Caesar in Belgis omnium legionum hiberna constituit. Eò duae civitates ex Britanniâ obsides miserunt, reliquae neglexerunt. Romae ex litteris Caesaris dierum viginti supplicatio a senatu decreta est. Interim naves aedificari veteresque refici jubet: ipse in fines Trevirorum profectus est, quod hi neque ad concilia veniebant neque imperio parebant. 29. Inde ad portum Itium pervenit, quò naves convenire jusserat, quòd inde erat brevissimus in Britanniam trajectus. Dies circiter viginti quinque in eo loco commoratus est, quòd Corus ventus navigationem impediebat, qui magnam partem omnis temporis his in locis flare consuevit. Tandem idoneam nactus tempestatem milites equitesque conscendere in naves jubet. Labienum in continente cum tribus legionibus et millibus duobus equitum relinquit, ut portas tueatur et frumentum provideat. Ipse cum quinque legionibus et pari numero equitum, quem in continente reliquerat, ad

Preparations made during the winter for a second invasion to be undertaken in the following summer.

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71. Postea Caesar Romam regressus quarto se consulem fecit, et statim ad Hispanias est profectus, ubi Pompeii filii, Cnaeus et Sextus, ingens bellum reparaverant. Multa proelia fuerunt, ultimum apud Mundam civitatem, in quo adeo Caesar paene victus est, ut, fugientibus suis, se voluerit occidere, ne post tantam rei militaris gloriam in potestatem adolescentium natus annos sex et quinquaginta veniret. Denique, reparatis suis, vicit. Ex Pompeii filiis major occisus est, minor fugit.

War with Pompey's sons. B.C. 45.

72. Inde Caesar, bellis civilibus toto orbe compositis, Romam rediit. Agere insolentius coepit et contra consuetudinem Romanae libertatis. Quum ergo et honores ex suâ voluntate praestaret, qui a populo antea deferebantur, nec senatui ad se venienti assurgeret, aliaque regia ac paene tyrannica faceret, conjuratum est in eum a sexaginta vel amplius senatoribus equitibusque Romanis. Praecipui fuerunt inter conjuratos duo Bruti, ex eo genere Bruti, qui primus Romae consul fuerat et reges expulerat, C. Cassius et Servilius Casca. Ergo Caesar, quum senatus die inter ceteros venisset ad curiam, tribus et viginti vulneribus confossus est.

Death of Caesar. B.C. 44.

CIVIL WAR RENEWED.

73. Anno urbis septingentesimo fere ac nono, interfecto Caesare, bella civilia reparata sunt. Percussoribus enim Caesaris senatus favebat.

Antony and Octavianus. B.C. 43.

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II. 11 A.

RULE.—**A purpose is expressed in English by the infinitive, as** He sent the soldier *to report*, etc. This in Latin would be expressed by **ut** (=in order that) with **pres. or imperf. subjunctive as—misit militem ut renuntiaret. If the verb in the principal sentence is present, present perfect, future simple, or future perfect tense, then a present subjunctive will follow after ut. If the verb in the principal sentence is imperfect, past indefinite, or pluperfect, then an imperfect subjunctive must be used after ut, as militem** $\left.\begin{matrix}\text{mittit}\\ \text{misit}\end{matrix}\right\}$ **ut** $\left\{\begin{matrix}\text{renuntiet.}\\ \text{renuntiaret.}\end{matrix}\right.$

1. The soldier was sent *to* demand peace.
2. The consul will send a soldier to report the death of Pyrrus.
3. He demands that the army should be dismissed.
4. He had come *to* give the gold to the soldier.
5. Have you sent a soldier to Rome *to* report the surrender of the enemy?
6. He came into the camp *to* see the general.
7. He has sent legates *to* seek peace.

II. 11 B.

1. The general sent soldiers *to* bury the dead.
2. We had gone from the city *to* see the battle.
3. *Raising his hands* to heaven he spoke with a loud (magna) voice.
4. Tarquinius made war on the Romans that he might be restored to his kingdom
5. The Romans feared the elephants which Pyrrus had.
6. When night had put an end to the battle they buried the dead.

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177. *Q. Cicero, Caesar's Lieutenant, sends out Foragers from his Camp.*

Cicero, qui per omnes superiores dies praeceptis Caesaris cum summa diligentia milites in castris continuisset ac ne calonem quidem quenquam extra munitionem egredi passus esset, septimo die diffidens de numero dierum Caesarem fidem servaturum, quod longius eum progressum audiebat neque ulla de reditu ejus fama afferebatur, simul eorum permotus vocibus, qui illius patientiam paene obsessionem appellabant, si quidem ex castris egredi non liceret, quinque cohortes frumentatum in proximas segetes misit quas inter et castra unus omnino collis intererat.

Caesar.

178. *Zeus kills Phaethon with a Flash of Lightning.*

At Phaethon, rutilos flamma populante capillos,
volvitur in praeceps, longoque per aera tractu
fertur: ut interdum de coelo stella sereno
etsi non cecidit, potuit cecidisse videri.
Quem procul a patria diverso maximus orbe
excipit Eridanus, spumantiaque abluit ora.
Naiades Hesperiae trifida fumantia flamma
corpora dant tumulo: signantque hoc carmine saxum:
HIC SITUS EST PHAETHON, CURRUS AURIGA PATERNI:
QUEM SI NON TENUIT, MAGNIS TAMEN EXCIDIT AUSIS.

Ovid.

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209. Hannibal on the Alps.

Tandem nequicquam iumentis atque hominibus fatigatis castra in iugo posita, aegerrime ad id ipsum loco purgato, tantum nivis fodiendum atque egerendum fuit. Inde ad rupem muniendam, per quam unam via esse poterat, milites ducti, cum caedendum esset saxum, arboribus circa immanibus deiectis detruncatisque struem ingentem lignorum faciunt, eamque, cum et vis venti apta faciendo igni coorta esset, succendunt ardentiaque saxa infuso aceto putrefaciunt. Itaque torridam incendio rupem ferro pandunt, molliuntque anfractibus modicis clivos, ut non iumenta solum sed elephanti etiam deduci possent. Quatriduum circa rupem consumptum iumentis prope fame absumptis; nuda enim fere cacumina sunt et, si quid est pabuli, obruunt nives.

210. Poetry Lasts for Ever.

Ergo cum silices, cum dens patientis aratri,
  Depereant aevo, carmina nocte carent.
Cedant carminibus reges, regumque triumphi,
  Cedat et auriferi ripa beata Tagi.
Vilia miretur vulgus. Mihi flavus Apollo
  Pocula Castaliae plena ministret aquae:
Sustineamque coma metuentem frigora myrtum:
  Atque a sollicito multus amante legar.
Pascitur in vivis Livor: post fata quiescit,
  Cum suus ex merito quemque tuetur honor.
Ergo etiam, cum me supremus adederit ignis,
  Vivam, parsque mei multa superstes erit.

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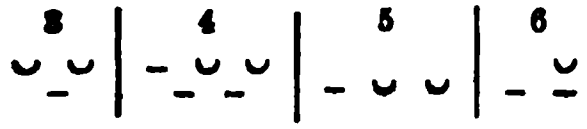
The Second Part of a Hexameter: The Longer Half.



mūlt/ōs flŭĭt / illĕ pĕr/ānnōs
cĕcĭn / ērūnt / cārmĭnă / mūltī

See Rule to Ex. 4.

1. it-had-contracted the little shadows.
2. "shall we endure these-things unavenged?"
3. he-made most-beautiful songs.
4. (my) better years having-been-passed [1].
5. he lies upon (*per*) the green grass (*pl.*)
6. he-left (his) companions in the valley.
7. having-followed by-sea and land.
8. and he-passed his-life in (*per*) ease.
9. she possesses many cities.
10. "I-perish, dearest mother."
11. (He sees) the Gauls congregated in the valley.
12. most-sad (*fem.*) on-a-lofty rock.
13. she-was-driving-back the she-goats from-the-cliff.
14. about-to-enter (*fem.*) the little homestead.
15. show-her (*pl.*) to-her-wretched parent.
16. nor was the mind fit for-labour.
17. and buried (*pl.*) *in-good-time* [2].
18. for thou dost afford consolation.
19. thou leadest us down to the sea.
20. and the shepherd reclines under a tree.
21. he-said, "Companions, approach."
22. it-covers all-things round with-darkness.
23. and the silence (*pl.*) of quiet sleep.
24. but the general did not think-them true-things.

[1] Abl. abs. [2] *tempestīvē.*

[SPECIMEN PAGE]

The Voice of the Sluggard.

Now comes over the ocean from (her) elderly husband
The yellow (goddess) who carries the day on her frosty car.
Whither art-thou-hurrying, Aurōra? Wait. Now (are) the times of sleep:
And the bird sings (her) song with slender throat.
Whither art thou hurrying, unwelcome to men, unwelcome to girls?
Stay[1] thy dewy bridle with purple hand.
Before thy rising the sailor[2] observes his stars better,
Nor does he wander without-knowledge in the midst of the water.
When thou dost come[3] the traveller arises, however[4] tired:
And the soldier fits his arm-bearing hands to[5] arms.
Thou art the first to see (men) burdened with the hoe cultivating the fields,
Thou art the first to call the slow oxen under the curved yokes.
Thou dost cheat boys of sleep, and give-them-over to (their) teachers,
That their tender hands may undergo cruel blows.
How-often have I-wished[6] that[7] the night might not be-willing to yield to thee,
And that[8] the stars might not *move and fly-from*[9] thy countenance.
How-often have I wished[6] either (that) the wind might break thy car,
Or (that) thy horse might fall, held-back by a thick cloud.
I-could-wish[10] (that) it-might-be-permitted to Tīthōnus to tell-stories about thee,
(There) would not be any uglier tale in-the-heaven.

[1] *supprĭmĕre.* [2] In pent. [3] "thou coming;" Hints, 8 (*c*).
[4] *quamvīs.* [5] *ăd.* [6] *optāre.* [7] that . . . not, *nē.*
[8] and that . . . not, *neu.*
[9] Say "the stars having-been-moved might-fly from."
[10] impf. subj. *vŏle.*

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ossibus haerentem. quem non super occupat Hisbo,
ille quidem hoc sperans ; nam Pallas ante ruentem,
dum furit, incautum crudeli morte sodalis,
excipit, atque ensem tumido in pulmone recondit.
hinc Sthenelum petit, et Rhoeti de gente vetusta
Anchemolum, thalamos ausum incestare novercae.
vos etiam gemini Rutulis cecidistis in arvis,
Daucia, Laride Thymberque, simillima proles,
indiscreta suis gratusque parentibus error ;
at nunc dura dedit vobis discrimina Pallas :
nam tibi, Thymbre, caput Euandrius abstulit ensis ;
te decisa suum, Laride, dextera quaerit,
semianimesque micant digiti ferrumque retractant.
Arcadas, accensos monitu et praeclara tuentes
facta viri, mixtus dolor et pudor armat in hostes.
tum Pallas biiugis fugientem Rhoetea praeter
traicit. hoc spatium tantumque morae fuit Ilo ;
Ilo namque procul validam derexerat hastam :
quam medius Rhoeteus intercipit, optime Teuthra,
te fugiens, fratremque Tyren ; curruque volutus
caedit semianimis Rutulorum calcibus arva.
ac velut, optato ventis aestate coortis,
dispersa inmittit silvis incendia pastor ;
correptis subito mediis extenditur una
horrida per latos acies Vulcania campos ;
ille sedens victor flammas despectat ovantes :
non aliter socium virtus coit omnis in unum,
teque iuvat, Palla. sed bellis acer Halaesus
tendit in adversos, seque in sua colligit arma.
hic mactat Ladona Pheretaque Demodocumque ;
Strymonio dextram fulgenti deripit ense
elatam in iugulum ; saxo ferit ora Thoantis,
ossaque dispersit cerebro permixta cruento.
fata canens silvis genitor celarat Halaesum ;
ut senior leto canentia lumina solvit,
iniecere manum Parcae, telisque sacrarum

417 cavens.

[SPECIMEN PAGE]

390. **vos etiam...**] 'you too, Larides and Thymber, fell twin brethren on Rutulian plains, the offspring of Daucus indistinguishable (174 n.) in utter likeness and to their own parents a dear perplexity.' **suis**, not *vestris*, because the poet has ceased to address them and passed into description of them. The passage is admirably imitated in Sil. It. 2. 636

> *vos etiam primo gemini cecidistis in aevo,*
> *Eurymedon fratrem, et fratrem mentite Lycorma,*
> *cuncta pares; dulcisque labor sua nomina natis*
> *reddere, et in vultu genetrici haerere suorum;*

and also by Claudian de Cons. Hon. 209 (of Castor and Pollux) *iuvat ipse Tonantem* | *error, et ambiguae placet ignorantia matri* (see La Cerda).

394. **Thymbre**] as if from *Thymbrus*, not *Thymber* (391); cf. for the two forms of the nom. *Teucer*, *Teucrus*.

395. **suum**] 'its master.'

396. **micant...**] 'the fingers twitch and again (seek to) handle the sword.'

398. **mixtus dolor et pudor**] 'mingled pain and shame'; *dolor* is their sense of soreness at their own cowardice.

400. **hoc...**] 'so much respite, so much reprieve (lit. 'such extent and amount of delay') had Ilus, for against Ilus he (*i.e.* Pallas) had aimed....'

404. **caedit calcibus**] Cf. 730; Hom. Od. 18. 99 λακτίζων ποσὶ γαῖαν. **sēmĭanĭmis**: 12. 356 n.

405. **optato**] 'according to his wish,' because the shepherd has been waiting for a good opportunity for thus firing a wooded tract; see 12. 521 n. As he fires the brushwood from different points until at last there is a general blaze, so the different exploits of Pallas at last fire all his followers.

407. **mediis**] *i.e.* the space between each separate fire. When these 'catch fire' then 'Vulcan's array stretches in one bristling line over the broad plains.' **horrida** is, as usual, untranslatable, suggesting (1) the uneven jagged appearance of the line of flame, (2) a line of troops with bristling spears, and (3) that which causes shuddering or fear.

410. **socium**]=*sociorum*; cf. 8. 127 n.

412. **seque...**] 'and gathers himself up within his shield,' so as to leave no part exposed as he attacks. In 12. 491 the same attitude is adopted for defence.

415. **elatam in iugulum**] 'raised to strike his (Halaesus') throat.'

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UPLIFT a thousand voices full and sweet
In this wide hall, with earth's inventions stored,
And praise th' invisible, universal Lord,
Who lets once more in peace the nations meet,
Where Science, Art, and Labour have outpour'd
Their myriad horns of plenty at our feet.

O silent father of our kings to be,
Mourn'd in this golden hour of jubilee,
For this, for all, we weep our thanks to thee!

RETRANSLATION.

Uplift together a thousand voices and sounding applause,
Where this floor houses the treasures conveyed-together;
Praising the One Deity, visible to none,
Who suffers the peoples again to meet-together in peace,
Where Labour and Skill joined to Art its handmaid,
Have poured the full horns at our feet.
And thou, silent father of the race to which thou hast given the sceptre,
Whom the hour of rejoicing (though) golden yet grieves-for,
These things too, (and) many things also due to thee, weeping
We look-back-upon, and continue thy praises.

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spectare in (*vergere ad*) *orientem* (*solem*), *occidentem*[1] (*solem*), *ad meridiem*, *in septentriones*—to lie to the east, west, south, north.

spectare inter occasum solis et septentriones—to be situate to the north-west.

Germania quae or *Germaniae ea pars quae*, *ad orientem*, *occidentem vergit*—eastern, western Germany.

est a septentrionibus collis—a hill lies to the north.

situs loci—the situation of a place.

natura loci—the natural position of a place.

opportunitas loci (B. G. 3. 14)—the advantageous situation of a place.

opportuno loco situm or *positum esse*—to be favourably situated.

urbs situ ad aspectum praeclara est—the city is very beautifully situated.

oppidum mari adiăcet—the town lies near the sea.

villa tangit viam—the country-house stands near the road.

oppidum colli impositum est—the town stands on rising ground.

oppidum monti subiectum est—the town lies at the foot of a mountain.

promunturium in mare procurrit—a promontory juts out into the sea.

[1] "The east" and "the west" = *orientis*, *occidentis* (*solis*) *terrae*, *partes*, *regiones*, *gentes*. The adjectives *orientalis*, *occidentalis* are not used in good Latin. The north, i.e. northern countries, is represented by *terrae septentrionibus subiectae*; the south by *terra australis*.

[SPECIMEN PAGE]

suis legibus utitur (B. G. 1. 45. 3)—(a state) has its own laws, is autonomous.

nullam habere rem publicam—to have no constitution, be in anarchy.

rem publicam in pristĭnum statum restituere—to restore the ancient constitution.

optima re publica—at the time of a most satisfactory government.

libera res publica, liber populus—the Republic.

rem publicam gerere, administrare, regere, tractare, gubernare—to govern, administer the state.

rei publicae praeesse—to have the management of the state.

ad gubernacula (metaph. only in plur.) *rei publicae sedere*
clavum rei publicae tenere
gubernacula rei publicae tractare
} to hold the reins of government.

principem civitatis esse—to be the chief man in the state.

principem in re publica locum obtinere—to hold the first position in the state.

negotia publica (Off. 1. 20. 69)—public affairs.

vita occupata (*vid.* p. 94)—the busy life of a statesman.

accedere, se conferre ad rem publicam
rem publicam capessere (Off. 1. 21. 71)
} to devote oneself to politics, a political career.

in re publica or *in rebus publicis versari*—to take part in politics.

rei publicae deesse (opp. *adesse*)—to take no part in politics.

a negotiis publicis se removere
a re publica recedere
} to retire from public life.

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2. Ὁ παῖς φησι τὸν δεσπότην αὐτὸν κολάσειν.
3. Συνῄδει γὰρ ἑαυτῷ ἀδικῶν.
4. Γυνὴ πρόθυμος μᾶλλόν ἐστίν ἢ σοφωτέρα.
5. Μείζονι τῇ φώνῃ ἢ κατ' ἄνδρα ἐβόησεν.
6. Ἀλλ' εὐτυχοίης καὶ τύχοις ὅσων ἐρᾷς.
7. Λαβόντες δὲ τὰ ὅπλα παρῆσαν ἐς Σάρδεις.
8. Πᾶν ποισοῦσιν ὥστε μὴ δοῦναι δίκην.
9. Ἔγωγε βοηθητέον εἶναί φημι τοῖς πένησι.
10. Παρασκευὴν δ' εὐθὺς ἐποιήσαντο ὡς τῇ πόλει προσβαλοῦντες.
11. Πλανώμενοι οὖν νυκτὸς διὰ τῆς χιόνος οὐκ ᾔδεσαν οἱ στρατηγοὶ ὅποι τράποιντο.
12. Ἀπεκρύψατο ταῦτα τὸν πατέρα.
13. Τὸ δὲ μέγα τεῖχος ἐπαίσαντο οἰκοδομοῦντες φοβούμενοι μὴ οὐχ ἱκανὸν εἴη ἀντέχειν.
14. Διδάσκομαι τοὺς παῖδας ἱππεύειν καὶ τοξεύειν.

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πάνυ δὲ ὀλίγοι ἀμφ' αὐτὸν κατελείφθησαν, σχεδὸν οἱ ὁμοτράπεζοι καλούμενοι.

σὺν τούτοις δὲ ὢν καθορᾷ βασιλέα καὶ τὸ ἀμφ' ἐκεῖνον στίφος·

καὶ εὐθὺς εἰπὼν, "τὸν ἄνδρα ὁρῶ," ἵετο ἐπ' αὐτόν·

καὶ παίει κατὰ τὸ στέρνον καὶ τιτρώσκει διὰ τοῦ θώρακος.

27. παίοντα δ' αὐτὸν ἀκοντίζει τις παλτῷ ὑπὸ τὸν ὀφθαλμὸν βιαίως·

καὶ ἐνταῦθ' ἐμάχοντο καὶ βασιλεὺς καὶ Κῦρος, καὶ οἱ ἀμφ' αὐτοὺς ὑπὲρ ἑκατέρου.

Κῦρος δὲ αὐτός τε ἀπέθανε καὶ ὀκτὼ οἱ ἄριστοι τῶν περὶ αὐτὸν ἔκειντο ἐπ' αὐτῷ.

ἀποθνήσκοντος δὲ αὐτοῦ, πάντες οἱ περὶ αὐτὸν φίλοι καὶ συντράπεζοι ἀπέθανον μαχόμενοι ὑπὲρ Κύρου πλὴν Ἀριαίου.

ὡς δὲ ᾔσθετο Κῦρον πεπτωκότα, ἔφυγεν, ἔχων καὶ τὸ στράτευμα πᾶν, οὗ ἡγεῖτο.

28. βασιλεὺς δὲ καὶ οἱ σὺν αὐτῷ διώκων εἰσπίπτει εἰς τὸ Κυρεῖον στρατόπεδον·

καὶ οἱ μὲν μετὰ Ἀριαίου οὐκέτι ἵστανται, ἀλλὰ φεύγουσι διὰ τοῦ αὐτῶν στρατοπέδου εἰς τὸν σταθμὸν, ἔνθεν ὥρμηντο.

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EXTRACT FROM PREFACE

"This *Grammar* has been revised and in part re-written, but the general arrangement remains as it was. To change this might have done away with something that commended it to teachers; for the success of a school-book is often due to the fortunate accident of one man's work happening to meet the views of the majority.

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CHAPTER VI

§§X.—XVII

FIRST DECLENSION

39. Of the words you have already learned, Ἑρμῆς is really a contracted form of an older Ἑρμέᾱς. There are also a few feminine nouns contracted in the same way, as συκῆ, *fig-tree*, for συκέᾱ.

N. V.	συκῆ
A.	συκῆν.
G.	συκῆς.
D.	συκῇ

But a few contract the εα into α, which they retain throughout, as μνᾶ, *mina* (*a sum of money*), for μνέᾱ, βορρᾶς, *north wind*, for βορέᾱς.

N.	μνᾶ.	βορρᾶς.
V.	μνᾶ.	βορρᾶ.
A.	μνᾶν.	βορρᾶν.
G.	μνᾶς.	βορρᾶ
D.	μνᾷ.	βορρᾷ.

The plural is always the same whether for masculine or feminine, for contracted or uncontracted nouns.

40. The dative plural was originally formed by adding ισι to the stem, as, stem τῑμα, dative plural τῑμα-ισι, and this longer form you will find in Attic poetry, and occasionally in elevated prose.

The genitive plural was formed by adding -ων to the stem, as τῑμᾰ́-ων, which became by contraction τῑμῶν. It is due to this fact that all nouns of the first declension have

Vowels long by nature, except η and ω, are marked long, unless they carry the circumflex accent.

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[SPECIMEN PAGE]

B. DEPENDENT INTERROGATIVE PROPOSITIONS.

§§ 246-252

Single: introduced by ὅστις, ὁποῖος, ὁπόσος, ὅπου, ὅποι, εἰ, etc.

Double: introduced by εἰ . . . ἤ, πότερον . . . ἤ, εἴτε . . . εἴτε.

Rule.—When principal verb primary, same mood and tense as if a direct interrogative proposition: when principal verb historic either (1) same mood and tense, or (2) same tense of optative.
For Interrogative Particles see Chapter X.

Note.—Negative μή if question is deliberative.

ἐρωτᾷ ὅστις ἐστίν. ἤρετο ὁπόθεν ἦλθον. οὐκ οἶδεν ὅποι τράπηται. οὐκ ἦσαν ὅποι τράπωνται. ἤρετο πότερον αὐτὸς εἶσιν ἢ σύ. ἠρόμην ὅστις εἴη. οὐκ ἤδη ὅποι τραποίμην. ἤρετο πότερον ἐγὼ ἴοιμι ἢ σύ. §§ 247, 248.

ἤρετο εἰ οὐκ αἰσχύνεται. ἐρωτῶσι πότερον δέδρακεν ἢ οὔ. σκόπει εἰ ἔτι οὕτως ἔχει ἢ οὔ. οὐκ ἦσαν πότερον πορευθῶσιν ἢ μή. ἐβουλεύετο εἴτε πέμποιέν τινας εἴτε πάντες ἴοιεν. ἐβουλεύετο ὁ φὼρ εἰ λέγοι τἀληθὴ ἢ μή. § 249.

Anticipatory Construction. § 250.

τοὺς νόμους σκοπῶμεν ὅ τι διδάσκουσιν. ἠπόρει περὶ τῆς ὁδοῦ ὅποι φέρει. § 250.

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[SPECIMEN PAGE]

τράπεζαν. 4. *λύσομεν τὰς ζώνας τοῖς κριταῖς.* 5. *ἡ Ἥρα ἔσειε τὴν γῆν.* 6. *ὁ τοῦ κριτοῦ ταμίας θύει τῷ Ἑρμῇ.* 7. *κρούομεν τὴν τῆς κόρης θύραν.* 8. *ἔθυε τὸν ναύτην τῇ Ἥρᾳ.* 9. *κρούσετε τοὺς νεανίας.* 10. *ἐσείομεν τὴν τοῦ νεανίου τράπεζαν.*

10.—1. I was striking the citizen. 2. They shake the table. 3. I was shaking the tables. 4. Of the wisdom of the citizens. 5. Ye strike the young man. 6. The young men's cloaks. 7. You were shaking the steward. 8. They used to sacrifice to Hermes. 9. We were loosing the sailors. 10. We shall strike the judge.

11.—1. The wisdom of the steward. 2. Hermes was shaking the earth. 3. The stewards' cloaks. 4. The sailors will sacrifice in the land. 5. We will loosen the judge's cloak. 6. He was knocking-at the citizen's door. 7. We shall shake the earth. 8. The judges were loosening their [say "the"] cloaks. 9. The young men shake the doors. 10. I shall loosen the belt for the sailor.

12.—1. He used to sacrifice in the land. 2. They used to sacrifice to Hermes. 3. The stewards knock-at the door. 4. I was knocking-at the judges' doors. 5. The sailors will shake the tables. 6. Ye were

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12.—1. *ἐτείχισαν τὴν πόλιν ὑπὸ τῶν στρατηγῶν πεισθέντες.* 2. *οὐκ ἠνάγκασα ὑμᾶς τὴν εἰρήνην ἄγειν.* 3. *ἠθροίκασιν οἱ Λακῶνες τὸ στράτευμα ἐν τῇ νήσῳ.* 4. *θαυμασόμεθα ὑμᾶς, ὦ νεανίαι, τοιαῦτα δεχομένους.* 5. *ἤθροισται τὸ τῶν Ἑλλήνων στράτευμα.* 6. *οὐκ ἐπίθετο τοῖς ἐμοῖς λόγοις ὁ στρατηγός.* 7. *ἠναγκάσμεθα πείθεσθαι τοῖς γέρουσι.* 8. *ἡμῖν καλῶς πράττουσιν οὐ πείσονται.* 9. *ταῦτα δεῖ κομισθῆναι εἰς τὴν πόλιν.* 10. *δεῖ πείθεσθαι τοῖς ἄρχουσι.*

13.—1. We shall muster the army on the plain of the river. 2. We did not compel you to prepare these things. 3. They have been saved by the Athenians. 4. You will not obey me nor (*οὐδέ*) do you think this to be just. 5. Having spoken falsely they have persuaded you. 6. I marvelled at those

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EXERCISES

X.—§§ 32-35

1. He has made his money more. 2. He is ashamed of his own citizens. 3. You praise my virtue, friends, but not your own. 4. Parents do not hate their own children. 5. You have told me my character; come now, tell me your own. 6. Your father has given me all these books. 7. Soldiers love their own generals. 8. They think that the goddess loves her own grove. 9. We have killed our own friend. 10. My brother hates town and longs for his parish.

XI.—§§ 36, 37

1. He struck himself with his hand. 2. Such men love themselves more than their friends. 3. We shall take the best counsel for ourselves. 4. He thought that the maiden loved him. 5. Bad boys think that their masters hate them. 6. They feared that the enemy would pursue them. 7. The king wished his sons to give way to him. 8. The maiden bade her servants wait for her. 9. A wise man gives himself many presents. 10. The cowardly boys feared that the dog would bite them.

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(3) Various Questions and Answers.

1. *Boys.*—*βλέπομεν, ὦ κύον, μὴ δάκῃς ἡμᾶς.*
   D.—*θαρρεῖτε, παιδία, κύων τεύτλια οὐκ ἐσθίει.*

2. *D.*—(To a bad musician). *χαῖρε, ὦ ἀλεκτρυόν.*
   Singer.—*τί δὲ ἐμὲ ἀλεκτρυόνα καλεῖς;*
   D.—*ὅτι ᾄδων πάντας ἐγείρεις.*

3. *Friend.*—*τί τῶν θηρίων κάκιστα δάκνει;*
   D.—*τῶν μὲν ἀγρίων συκοφάντης, τῶν δὲ ἡμέρων κόλαξ.*

4. *Friend.*—*ποίῳ καιρῷ δεῖ γαμεῖν;*
   D.—*τοὺς μὲν νέους μηδέπω, τοὺς δὲ πρεσβυτέρους μηδέποτε.*

5. *Friend.*—*ἢ θεράποντα, ἢ θεράπαιναν ἔχεις;*
   D.—*οὐκ ἔγωγε.*
   F.—*ὅταν οὖν ἀποθάνῃς, τίς σε ἐξοίσει;*
   D.—*ὁ χρῄζων τῆς οἰκίας.*

6. *Friend.*—*ποῖον οἶνον ἡδέως πίνεις;*
   D.—*τὸν ἀλλότριον.*

7. *D.*—*ὁ ἐμὸς δοῦλος ἀποδέδρακεν.*
   Friend.—*τί οὖν οὐ ζητεῖς αὐτόν, ὦ Διογένες;*
   D.—*γέλοιον ἂν εἴη, εἰ Μανῆς μὲν χωρὶς Διογένους ζῇ, Διογένης δὲ χωρὶς Μανοῦ οὐ δύναται ζῆν.*

8. *Friend.*—*πόθεν ἥκεις, ὦ Διογένες;*
   D.—*ἀπὸ τῶν Ὀλυμπίων.*
   F.—*ἦ πολὺς ὄχλος παρῆν;*
   D.—*πολὺς μὲν ὄχλος, ὀλίγοι δὲ ἄνθρωποι.*

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THIS book aims at bringing a pupil as quickly as possible to a comprehension of the principles on which Greek compound sentences are constructed. Before beginning Greek, boys as a general rule have worked out a considerable number of elementary Latin exercises, and this kind of work prepares the mind to deal with the difficulties caused by inflexions in language. It is therefore felt that a boy can be taken through the declensions and the conjugation of a regular verb like λύω without a special exercise-book on this, the earliest stage in learning the language: the teacher himself can supply what is necessary, in the ordinary course of Greek Grammar lessons. This book is designed to be used as soon as a boy has passed through this preliminary stage.

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CHAPTER XX

Explanatory to Exercise XXVII

46. Frequently an indirect question takes such a form as:

I do not know what to do,
whither to go,
whom to ask.

The direct form of such questions would be:

What am I to do?
Whither am I to go?
Whom am I to ask?

Such questions, implying anxiety or perplexity as to the course of action to be adopted, are done in Greek by what is called the Deliberative Subjunctive:

What am I to do? = *τί πράξω*; (aor. subj.).
Whither am I to turn? = *ποῖ τράπωμαι*;

When such questions have to be made indirect, they follow the general rule as stated above; thus:

Primary Sequence. I ask what I am to do = *ἐρωτῶ ὅ τι πράξω.*

Historic. I asked what to do = *ἠρώτησα ὅ τι πράξαιμι* (vivid, *ὅ τι πράξω*).
He is in doubt whither to turn = *ἀπορεῖ ὅποι τράπηται.*
He was in doubt whither to turn = *ἠπόρει ὅποι τράποιτο* (vivid, *τράπηται*).

Do not use the infinitive for the verb of such indirect sentences.

οὐ, οὐδείς, etc.	μή, μηδείς, etc.
In Temporal Sentences—	
Definite:	Indefinite:
ἐπειδὴ οὐκέτι ἦν σιτία, ταλαιπώρως εἶχον = When there were no longer any provisions, they suffered.	(*N.B.*—μή and its compounds are used in *all* indefinite clauses, not only the temporal.) ἀχθέσεσθε ἐπειδὰν μηκέτι σιτία ὑμῖν γένηται = You will be annoyed when you no longer have food.
In Relative Sentences—	
Definite, with Indic.:	Indefinite, with Indic.:
ἔκτειναν τὸν ἄνδρα ὃν οὐκ ἐφίλησαν = They killed the man whom they did not like.	ἃ μὴ οἶδα, οὐδὲ οἴομαι εἰδέναι = The sort of things I know not, I do not either think I know.
	With the ordinary indefinite construction (§ 50): κτείνουσιν ὄντινα ἂν μὴ φιλῶσιν = They kill any one they do not like.
In Conditional Sentences—	
In Apodosis:	In Protasis:
ἆρ' οὐκ ἀχθέσεσθε; = Will you not be vexed?	εἰ μηκέτι ὑμῖν σιτία γενήσεται; = If you no longer have any food?
In Causal Sentences—	
ἤχθοντο διότι οὐκ ἦν σιτία πρίασθαι = They were vexed because it was not possible to get provisions (real reason).	

13. To whom am I to say this?
14. What am I to announce?
15. Where are we to sail to?
16. Which of the two am I to believe?
17. Are we to speak or be silent?
18. Which of these men are we to choose?
19. Shall we stay or depart?
20. Why is the king vexed?

Exercise XXVII

1. The soldiers asked why their generals were waiting so long a time.
2. Who knows whether he will still live another day?
3. Nobody could tell me which way to go.
4. I will tell you what to look for.
5. I am in doubt whether to go to Athens or to Corinth.
6. The Governor asked the sailor where he had sailed to and what he had seen.
7. The Phoenicians said that they tried to sail round Libya in order to find out how big it was, but at last their ship stuck in shallow water and they had to return.
8. He could not say which of the two houses he liked best.
9. Many travellers have wondered why Homer called the Ethiopians blameless.
10. We did not know whether our general was safe.

IX

The manners of the gods about whom Homer wrote are very quaint, and sometimes the gods seem to act much more savagely than the men. Zeus often used to quarrel with his wife Hera. For she wished Troy to be destroyed as quickly as possible, but Zeus often protected the Trojans. Once Zeus threatened that he would hang her up and beat her, as he had done before. And another time, when they were quarrelling, the lame god Hephaestus persuaded Hera not to oppose her husband any longer, saying that no god could resist Zeus, and that once he himself, when he had tried to help her before, had been thrown out of Olympus and had fallen for a whole day till he reached the earth.

X

Homer therefore does not seem to have thought that the gods must be much better than men. Hector the Trojan certainly loved his wife Andromache, and treated her better than Zeus (did) Hera. And sometimes the gods were even weaker in battle than men. For they often used to come down from heaven to earth to fight for those whom they liked. They used to add strength to any hero whom they especially favoured, or aim his spear or sword so as to slay his foe; and, whenever he was in danger, they would hide him in a dense cloud. But they could not always do whatever they liked. For once Aphrodite, the goddess

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II. Comparison by -ιων, -ιστος.

§ 72. 1. Some adjectives in υς and ρος are compared by changing *these endings* to ῑων and ιστος. *E.g.*

Ἡδύς, *sweet*, ἡδίων, ἥδιστος.
Αἰσχρός, *base*, αἰσχίων, αἴσχιστος.
Ἐχθρός, *hostile*, ἐχθίων, ἔχθιστος.
Κυδρός (poet.), *glorious*, κυδίων, κύδιστος.

2. Comparatives in ῑων, neuter ῑον, are thus declined:—

	Singular.		*Dual.*	
Nom.	ἡδίων	ἡδιον		
Acc.	ἡδίονα ἡδίω	ἡδιον	N. V. A.	ἡδίονε
Gen.	ἡδίονος		G. D.	ἡδιόνοιν
Dat.	ἡδίονι			

Plural.

N. V.	ἡδίονες ἡδίους	ἡδίονα ἡδίω
Acc.	ἡδίονας ἡδίους	ἡδίονα ἡδίω
Gen.	ἡδιόνων	
Dat.	ἡδίοσι	

Note 1. The terminations *-ονα, -ονες, -ονας* may drop *ν*, and be contracted into *-ω* and *-ους* (§ 47, Note). Notice recessive accent (§ 21, 3) in the neuter singular.

Note 2. The irregular comparatives in *ων* (§ 73) are declined like *ἡδίων*.

III. Irregular Comparison.

§ 73. 1. The following are the most important cases of irregular comparison:—

1.	ἀγαθός, *good*,	ἀμείνων, βελτίων, κρείσσων or κρείττων,	ἄριστος, βέλτιστος, κράτιστος.
2.	κακός, *bad*,	κακίων, χείρων, ἥσσων or ἧττων,	κάκιστος, χείριστος, (ἤκιστος, rare): adv. ἥκιστα.
3.	καλός, *beautiful*,	καλλίων,	κάλλιστος.
4.	μέγας, *great*,	μείζων,	μέγιστος.

Cognate Accusative (Internal Object).

§ **159.** Any verb whose meaning permits it may take an accusative of kindred signification. This accusative repeats the idea *already contained* in the verb, and may follow intransitive as well as transitive verbs. *E.g.*

Ἥδομαι τὰς μεγίστας ἡδονάς, *I enjoy the greatest pleasures.* Εὐτυχοῦσι τοῦτο τὸ εὐτύχημα, *they enjoy this good fortune.* So πίπτειν πέσημα, *to fall (a fall)*; νόσον νοσεῖν, *to suffer under a disease*; ἁμάρτημα ἁμαρτάνειν, *to commit an error (to sin a sin)*; δουλείαν δουλεύειν, *to be subject to slavery*; γραφὴν γράφεσθαι, *to bring an indictment*; νίκην νικᾶν, *to gain a victory.*

Note 1. A neuter adjective sometimes represents a cognate accusative, its noun being implied in the verb; as μεγάλα ἁμαρτάνειν (sc. ἁμαρτήματα), *to commit great faults.*

Note 2. A transitive verb may have a cognate accusative and another object at the same time; as, γράφεσθαί τινα τὴν γραφὴν ταύτην, *to bring this indictment against any one*; ἠδικήσαμεν τοῦτον οὐδέν, *we did this man no wrong.*

Accusative of Specification.—Adverbial Accusative.

§ **160.** 1. The accusative of *specification* (or *limitation*) may be joined with a verb, adjective, noun, or even a sentence, to denote a *part*, *character*, or *quality*, to which the expression refers. *E.g.*

Τυφλὸς εἶ τὰ ὄμματα, *you are blind in your eyes*; καλὸς τὸ εἶδος, *beautiful in form*; δίκαιος τὸν τρόπον, *just in his character*; κάμνω τὴν κεφαλήν, *I have a pain in my head*; τὰς φρένας ὑγιαίνειν, *to be sound in their minds*; διαφέρει τὴν φύσιν, *he differs in nature*; ποταμὸς, Κύδνος ὄνομα, εὖρος δύο πλέθρων, *a river, Cydnus by name, of two plethra in breadth*; καὶ τὰ μικρὰ πειρῶμαι ἀπὸ θεῶν ὁρμᾶσθαι, *even in small matters I try to begin with the Gods.*

2. An accusative in certain expressions has the force of an adverb. *E.g.*

Τοῦτον τὸν τρόπον, *in this way, thus*; τὴν ταχίστην (sc. ὁδόν), *in the quickest way*; τὴν ἀρχήν, *at first* (with negative, *not at all*); τέλος, *finally*; προῖκα, *as a gift*, gratis; χάριν, *for the sake of*; δίκην, *in the manner of*; τὸ πρῶτον or πρῶτον, *at first*; τὸ λοιπόν, *for the rest*;

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PREFACE TO THE SECOND EDITION

In this new edition the work, while retaining its main features unaltered, has been carefully revised. Although there are few pages where some small change has not been made, the increase in bulk is due more to wider spacing in the printing than to additional matter. The syntactical examples from Plautus are now quoted throughout from the Teubner text of Goetz and Schoell, which has been completed since the book was published in 1895; references to the Greek tragic poets are, as before, according to the numbering of the lines in Dindorf's *Poetae Scenici*.

The natural corollary to a book like this is an etymological treatment of the vocabulary of the Greek and Latin languages, in which the principles here laid down could be applied to a greater number of examples than the limits of the present work would allow. Such a *Latin Etymology* I hope soon to publish, and this will be followed at no great interval by a similar treatment of Greek Etymology.

In issuing the book again, I wish to offer my best thanks to the many scholars at home and abroad who have sent me suggestions or corrections and literature which would often otherwise (especially when published in Italy or Russia) have been inaccessible to me. Mr. Hertel, who translated the first edition into German, sent me a number of corrections for the index. Above all I owe much to my friends and

colleagues Professor Skeat, Dr. Postgate, and Mr. J. H. Moulton for the friendly interest they have always shown and the help which from time to time they have rendered me.

I hope printer's errors are neither numerous nor serious, thanks to the excellent workmanship of Messrs. R. & R. Clark's printers and the accuracy and untiring vigilance of their reader.

P. G.

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If, for instance, we are asked to find the value of £3·6818292... *to the nearest farthing*, we may begin by at once discarding all decimal figures beyond the third (using the fourth, if necessary, to correct the third): for £3·682 will give the same result (viz., £3. 13*s.* 7¾*d.*) as £3·6818292... to within less than a farthing.

Note. The reason of this is evident when we remember that 1 farthing = £$\frac{1}{960}$, which is *greater* than £$\frac{1}{1000}$ (or £·001). If, then, the decimal of £1 is corrected to the *third* place (*i.e.* made true to the nearest £·001) it cannot differ from the actual value by as much as £$\frac{1}{960}$, or 1 farthing. The student will find it convenient to acquire one of the various devices (explained in any text-book of Arithmetic) by which a sum of money can be expressed *at sight* as the decimal of £1 correct to the third place; and also the converse process.

Example 1. Add together £17·051$\dot{6}$, £8·197, and £12·3105$\dot{8}$, giving a result *true to the nearest farthing.*

17·051	65...
8·197	
12·310	58...
£37·559	2

Here the addition (in decimals of £1) need only be performed *correct to the third decimal place.*

And £37·559 = £37. 11*s.* 2¼*d.* (to the nearest farthing).

Example 2. Find *to the nearest farthing* the rent and taxes on 306·0108 acres at £5. 17*s.* 5*d.* an acre.

5·8,7,0,	8,3,3
306·0 1 0	8
1761·2 4 9	9
35·2 2 5	0
5 8	7
4	6
£1796·5 3 8	2

£5. 17*s.* 5*d.* = £5·87083$\dot{3}$,
and we have to multiply 5·870833... by 306·0108, retaining a result *true only to the third decimal place.*

Now £1796·538 = £1796. 10*s.* 9*d.* (to the nearest farthing).

Similarly a *weight* expressed as the decimal of a *ton*, if correct to the *fourth* decimal place, will give a result true to the nearest lb. (since the number of lbs. in 1 ton is less than 10,000); and

[SPECIMEN PAGE]

The Sum or Difference of Two Cubes.

81. If we divide a^3+b^3 by $a+b$ the quotient is a^2-ab+b^2: and if we divide a^3-b^3 by $a-b$ the quotient is a^2+ab+b^2.

We have therefore the following identities:

$$a^3+b^3=(a+b)(a^2-ab+b^2);$$
$$a^3-b^3=(a-b)(a^2+ab+b^2).$$

These results are very important, and enable us to resolve into factors any expression which can be written as the sum or the difference of two cubes.

Example 1. $8x^3-27y^3=(2x)^3-(3y)^3$
$=(2x-3y)(4x^2+6xy+9y^2).$

Note. The middle term $6xy$ is the *product* of $2x$ and $3y$.

Example 2. $64a^3+1=(4a)^3+(1)^3$
$=(4a+1)(16a^2-4a+1).$

We may usually omit the intermediate step and write down the factors at once.

Examples. $343a^6-27x^3=(7a^2-3x)(49a^4+21a^2x+9x^2).$
$8x^9+729=(2x^3+9)(4x^6-18x^3+81).$

EXAMPLES XII. g.

Resolve into factors:

1.	a^3-b^3.	**2.**	a^3+b^3.	**3.**	$1+x^3$.	**4.**	$1-y^3$.
5.	$8x^3+1$.	**6.**	x^3-8z^3.	**7.**	a^3+27b^3.	**8.**	x^3y^3-1.
9.	$1-8a^3$.	**10.**	b^3-8.	**11.**	$27+x^3$.	**12.**	$64-p^3$.
13.	$125a^3+1$.	**14.**	$216-b^3$.	**15.**	x^3y^3+343.		
16.	$1000x^3+1$.	**17.**	$512a^3-1$.	**18.**	$a^3b^3c^3-27$.		
19.	$8x^3-343$.	**20.**	x^3+216y^3.	**21.**	x^6-27z^3.		
22.	$m^3-1000n^6$.	**23.**	a^3-729b^3.	**24.**	$125a^6+512b^3$.		

Harder Cases of Resolution into Factors.

82. We shall now give some harder applications of the foregoing rules, followed by a miscellaneous exercise in which all the processes of this chapter will be illustrated.

Example 1. Resolve into factors $(a+2b)^2-16x^2$.

This expression, being *the difference between two squares*, is resolved into factors by the rule of Art. 80.

$$\therefore\ (a+2b)^2-16x^2=(a+2b+4x)(a+2b-4x).$$

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ELEMENTARY PRACTICAL MATHEMATICS

BY

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Adapted to the New South Kensington Syllabus

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EXTRACT FROM PREFACE

THE inability of artizan students to profit by much of the technical instruction given in polytechnics and similar institutes is largely due to insufficient preliminary training in Mathematics, for without a fair knowledge of this subject little or no real progress can be made in any branch of Physical Science. Notwithstanding this, classes in pure Mathematics are neither popular nor well attended by students of the industrial class. Even the enthusiastic apprentice seems to find it difficult to connect the instruction usually given in arithmetic, algebra,

and geometry with the work of the shop or factory. A number of attempts have been made to remedy this state of affairs. Classes in Technical and Workshop Arithmetic, Machine Calculations, Mensuration, and similar subjects have been started in many centres. The latest attempt to interest and benefit the "practical man" is the syllabus of Practical Mathematics issued by the Department of Science and Art. Judging from the Examination paper of May last, and the lectures delivered by Prof. Perry, F.R.S., to working men and to science teachers, the object of the course is to show the student how to prove and verify truths by experiment instead of arriving at elementary results through the ordinary processes of Euclid and other academic authorities. Abstract reasoning is to be relegated to the background, and concrete facts are to form the basis of the student's work.

The syllabus of Practical Mathematics, to which reference has been made, is so extensive in its scope that it is difficult to deal satisfactorily with all the points in it in a text-book such as the present. The course of study outlined in the following pages will consequently be found more than can be undertaken by backward students in one session. In such cases the plan of completing the course in two years may reasonably be adopted.

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CHAPTER II.—Units of Area and Volume. Density. Relative Density Principle of Archimedes.

CHAPTER III.—Time and its measurement. Angular measurement; Degrees, Radians. Geometrical construction.

CHAPTER IV.—Arithmetic. Signs of Operation: "× and ÷"; G.C.M.; L.C.M.; Vulgar Fractions; Decimals.

CHAPTER V.—Involution and Evolution. Simple Application of Arithmetical Rules.

CHAPTER VI.—Algebra. Addition, Subtraction, Multiplication, and Division. Simple Operations. Factors. Simplification of Algebraical Expressions. Indices.

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CHAPTER XI.—Measurement and Functions of Angles. Sine, Cosine, and Tangent.

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CHAPTER XIII.—Arithmetical progression. Geometrical progression, Geometric Mean and Arithmetic Mean. Simple Interest. Compound Interest. Discount.

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CHAPTER XVI.—Simpson's Rule.

CHAPTER XVII.—Mensuration. Solids. Areas, Volumes and Weights of Prisms (right and oblique). Cylinder, Hollow Cylinder, Pyramid, Cone, Frustum of Pyramid, Frustum of Cone, Guldin's Theorem. Surface and Volume of Sphere, Cylinder, Ring, Fly-wheel.

CHAPTER XVIII.—Linear Motion. Momentum. Force. Mass. Work. Energy (Potential and Kinetic).

CHAPTER XIX.—The Specification of Vectors. Polygon of Forces. Funicular Polygon. Graphic conditions of Equilibrium. Moments of Force. Parallel Forces. Bending Moment. Centre of Gravity. Roof Trusses. Moment of Inertia.

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Answers.

[SPECIMEN PAGE]

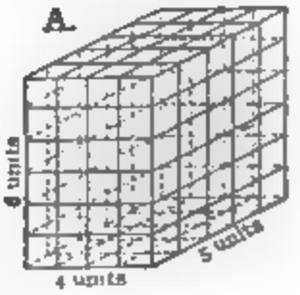
room, by the width, by the height; and the solidity of a body by multiplying the corresponding dimensions of length, breadth, and thickness.

Unless the system of duodecimals is employed each of the terms must be reduced to a common name as in finding area.

Inches × inches × inches = cubic inches; feet × feet × feet = cubic feet yards × yards × yards = cubic yards.

Suppose Block A to be
5 ft. long, 4 ft. wide, and 6 ft. thick,
then its solid content would equal
5 ft. × 4 ft. × 6 ft. = 120 c. ft.

N.B. This unit is now a cube of 1 foot edge.



Example (1). Find the solid content of a box whose length is 3 ft. 6 in., breadth 2 ft. 3 in., and depth 2 ft. 3 in.

Cubical content = length × breadth × depth
= 3 ft. 6 in. × 2 ft. 3 in. × 2 ft. 3 in.
= 42 in. × 27 in. × 27 in.
= 30618 cubic inches = 17 c. ft. 1242 c. in.

Example (2). Find, by duodecimals, the cubical content of a box measuring 3 ft. 6′ 9″ by 2 ft. 3′ 11″ by 2 ft. 3′.

Length,	3 ft.	6′	9″					
Breadth,				2 ft.	3′	11″		
	7	1′	6″					
		10′	8″	9‴				
		3′	3″	2‴	3⁗			
	8	3′	5″	5‴	2⁗			
Depth,					2 ft.	3′		
	16	6′	10″	10‴	6⁗			
	2	0′	▪	4‴	3⁗	9⁗′		
Cubical content,	18 c. ft.	7′	9″	2‴	9⁗	9⁗′		

N.B. The working can be followed by reference to the worked example in area above. The parts are cubic parts. The first is a twelfth part of the cubic foot.

When use is made of the duodecimal scale of notation explained on page 19, the example may be worked as illustrated under *area*. The symbol *t*=10, and *e*=eleven. The dots separate the feet from the parts.

Length,	3 ft.	6′ 9″	
Breadth,	2	3 *e*	
Multiplying by 2 ft.,	7	1 6	
" " 8′,		*t* 8 8‴	
" " *e*′,		3 3 2 3⁗	
	8	3 5 5 2	
Depth,	2	3	
Multiplying by 2 ft.,	16	6 *t* *t* 6	
" " 3′,	2	0 *t* 4 3 9⁗′	
Cubical content,	18 c. ft.	7 9 2 0 9	

9″ × 2 ft. = 18″; 18″ ÷ 12 = 1′ + 6″; carry 1′.
6′ × 2 ft. = 12′; 13′ ÷ 12 = 1 ft. + 1′; carry 1 ft.
3 ft. × 2 ft. = 6 ft.; 7 ft., etc.

N.B. Compared line by line with the sum above, it will be found exactly the same in every particular.

[SPECIMEN PAGE]

81. A box with a lid was constructed of planking 1 ft. 6 in. wide. The external dimensions of the box were 3 ft. 6 in. long, 2 ft. 6 in. wide, and 1 ft. 9 in. deep. How many feet of planking were used?

82. A garden 76 yds. long and 56 yds. broad has a flower border all round 4 feet wide, next to it going all round is a path 5 ft. wide. The middle is grass. Find the area of the lawn.

83. Find the cost of a fence, 6 boards high, each board 11 feet long, to enclose a rectangular field 60 rods long and 50 rods wide, the planks costing £5 per thousand.

84. A piece of paper 12 yards long and 27 inches wide cost 4/6. For what money could a room 20 feet long by 16 feet 6 in. wide, and 12 feet high be papered with the same?

85. A platform has to be erected with a length of 55 feet and breadth 10 yards. The planks to be used are 16 ft. 6 in. long and 10 inches wide, costing 7½d. per sq. foot. Find the cost of the timber.

86. The bottom of a cistern measures 5 ft. 9 in. by 3 ft. 6 in. and it contains 300 gallons of water. If a gallon occupied 275 cubic inches what was the depth of water?

87. If a grain of gold is beaten out into 54 square inches of gold leaf, what weight will be required to cover a cube 1 ft. 6 in. on each edge?

88. A cubic foot of gold weighs 10 cwt. 95 lbs. If an ounce avoirdupois of gold may be beaten to form a leaf of 20 square yards, how many such leaves will make an inch of thickness?

89. A room is 16 ft. 6 in. long, 14 ft. 6 in. wide and 10 ft. 3 in. high. There is a doorway 7 ft. 3 in. × 3 ft. 3 in., a fireplace 4 ft. 6 in. square, and there are 2 windows each 6 ft. × 3 ft. 6 in. together with a skirting board 6 in. high. Find how many square yards of paper will cover the walls.

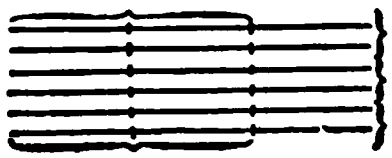
90. A roof 35 ft. 8 in. × 18 ft. 3 in. is to be covered with lead at the rate of 8 lb. per square foot. Find the cost of the same at a guinea per cwt.

91. What surface has to be painted if the walls of a room are 36 feet long, 24 feet wide, and 20 feet high, and allowance is made for a door 6 feet × 5 ft. 6 in., two windows each 7 ft. 6 in. × 3 ft. 9 in., and the whitewashing of the ceiling?

92. Find the cost of staining the border 2 ft. wide of a room 28 feet long by 22 feet in width, at a cost of 1/1½ per square yard.

(*b*) A *whole number* is divided by a *fraction* by *inverting the divisor* and proceeding as in multiplication, *e.g.*:

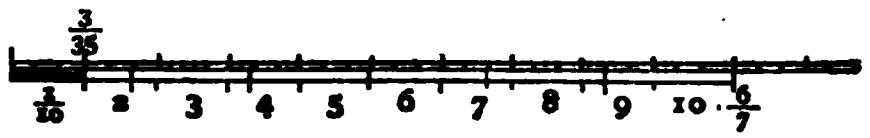
$$6 \div \frac{2}{3} = 6 \times \frac{3}{2} = \frac{18}{2} = 9.$$



In (*a*) $\frac{2}{3}$ is divided into 6 equal parts, each of which is $\frac{1}{3}$, while in (*b*) the question solved is how many parts called $\frac{2}{3}$ are there in 6, and there are 9.

(*c*) A *fraction* is divided by a *fraction* by (1) inverting the divisor, (2) cancelling, (3) multiplying, (4) reducing to simplest terms, *e.g.*:

$$\frac{3}{35} \div \frac{6}{7} = \frac{\cancel{3}}{\cancel{35}_{5}} \times \frac{\overset{1}{\cancel{7}}}{\cancel{6}_{2}} = \frac{1}{10}.$$



NOTE. Since $\frac{3}{35}$ divided by *one* equals $\frac{3}{35}$, then if divided by a *seventh* $\left(\frac{1}{7}\right)$ of one it will equal 7 times $\frac{3}{35}$, *i.e.* $\frac{3}{35} \times 7$; and if divided by six sevenths $\left(\frac{6}{7}\right)$ it will equal one-sixth of $\frac{3}{35} \times 7$, *i.e.* $\frac{3}{35} \times \frac{7}{6}$ the sign + being thus changed into × and the divisor $\frac{6}{7}$ into $\frac{7}{6}$, *i.e.* the divisor is inverted.

(*d*) *Mixed* numbers are divided by first reducing them to improper fractions, and then proceeding as in (*c*), *e.g.*:

$$3\tfrac{8}{9} \div 1\tfrac{1}{3} = \frac{35}{9} \div \frac{7}{6} = \frac{\cancel{35}^{5}}{\cancel{9}_{3}} \times \frac{\cancel{6}^{2}}{\cancel{7}_{1}} = \frac{10}{3} = 3\tfrac{1}{3}.$$

(*e*) A *complex* fraction is simplified by division, *e.g.*:

$$\frac{3\frac{8}{9}}{1\frac{1}{3}} = \frac{35}{9} \div \frac{7}{6} = \frac{35}{9} \times \frac{6}{7} = 3\tfrac{1}{3} \text{ (as above),}$$

or

$$\frac{3\frac{8}{9}}{1\frac{1}{3}} = \frac{\cancel{35}^{5}}{\cancel{9}^{3}} \div \frac{\cancel{7}^{1}}{\cancel{6}_{2}} = \frac{5}{3} \div \frac{1}{2} = \frac{5 \times 2}{3 \times 1} = \frac{10}{3} = 3\tfrac{1}{3}.$$

In the second working the outside numbers are the numerators and the inside the denominators, so the cancelling must be with 'inners' and 'outers,' and the *numerator* is the product of the '*outers*'—the *denominator* of the '*inners*.'

10. Rule of Signs.

(*a*) When +, −, ×, and ÷ signs are combined in an expression the + and − must be considered as *separating* the terms; × and ÷ as *uniting* them, that is to say, that × and ÷ unite the terms between which they are placed, and take precedence over the signs + and −.

(*b*) When an expression has × and ÷ signs the sign applies only to the fraction *immediately* following the sign.

24. A person's salary is £100 a year payable quarterly. Find the difference between his daily earnings in the two quarters beginning respectively on the 24th of June, and the 29th of September.

25. Sound travels through the air at the rate of 1142 ft. per second. A flash of lightning was observed and after 6 strokes of the pulse the thunder was heard. The pulse makes 68 strokes in a minute. How far off was the thunder cloud?

26. One pound Avoirdupois is 7000 grains Troy, and 66 shillings weigh 1 lb. Troy. Find the value of 20 Avoirdupois ounces of silver.

27. How many revolutions will a wheel make in a mile, the diameter of the wheel being 5 ft. 3 in., and the ratio of the circumference of a circle to its diameter being as 3·1416 is to 1?

28. The railway fare from Calais to Paris, a distance of 240 kilometres, is 38·16 francs; and from London to Dover, a distance of 70 miles, is 14s. 7d.; compare the cost of travelling in both countries when a metre=39·7068 inches and £1=25·44 francs.

29. If 35 men can do a piece of work in 45 days; and if 7 men drop off work every 15 days, find what time will elapse before the work is finished.

30. A certain number of workmen receive 50/- a week, twice as many receive 31/6 a week, 11 times as many 14/- a week; find the number of workmen when the total wages equal £93. 9s. 0d.

31. If a coach travels at the rate of $9\frac{1}{2}$ miles per hour, and a railway train runs 25 miles while the coach is going 8 miles; how much time will a traveller save in a journey of 152 miles by going by train?

32. If 200 men make an embankment 5 miles long in 25 days, how much overtime must 60 men work in order to finish an embankment 2 miles long in 32 days, 12 hours being a day's work?

33. If when meat is 9d. per lb. it costs £11. 16s. 3d. to supply 12 persons for 5 weeks, how much will it cost to supply 18 persons for 7 weeks when meat is 6d. per lb.?

34. A butler agrees to work a year for £128 and suits of clothes, but leaving at the end of nine months he gets £92 and the suits; what was the value of the clothes?

[SPECIMEN PAGE]

34. Bought 200 yards of cloth at 3/ a yard, the carriage costing £1. 12s. 0d. and storage 8s. If 10 per cent. of the cloth is lost by shrinkage, at what price per yard must the remainder be sold to gain a guinea on the whole transaction?

35. If I buy a house and sell it at a profit of £49, and find I make as much per cent. as the house cost me in sovereigns, how much did the house cost me?

36. Eggs are sold at the rate of 3 for 5 mils, and the gain at this rate is $1\frac{1}{5}$ of the cost; find at what rate per dozen they were purchased.

37. The number of sheep on a farm increases at the rate of 20 per cent. per annum. If at the end of two years there are 720 sheep, how many were there originally?

38. Watches are sold at a gain of 5 per cent. If the selling price of each watch were increased by 2/ the gain would then be 10 per cent. Find the cost price of each watch.

39. A tradesman marks his goods with two prices, one for ready money and the other for credit of six months. What ratio should the two prices bear to each other allowing interest at $7\frac{1}{2}$ per cent. per annum? If the credit price of an article be £33. 4s. 0d., what was the cost price?

40. By accepting A's offer for land I lose 7 per cent. on the purchase money; by accepting B's I should gain 5 per cent. B offers £273. 12s. 0d. more than A. Find what I paid.

5. Trade Customs. The applications of percentages are very varied owing, perhaps, to the eccentricities of traders; as, for example, in a business where goods are marked at a higher price than their real value, in order that a customer may receive an *abatement*, without the seller being in any way the loser, but rather the gainer. And, again, when several successive discounts are allowed.

Example (8). A chain sold at £2. 13s. 0d. gained 6 per cent.; at what price should it be sold to gain 12 per cent. instead?

For a gain of 6 per cent. let the selling price=£106, and for a gain of 12 per cent. let the selling price=£112.

Then 106 : 112 :: £2. 18s. 0d. : £2. 16s. 0d.

Example (9). When a silver watch was sold for £7. 17s. 6d. the gain was at the rate of 5 per cent.; at what price should it be sold to lose 10 per cent.?

For a gain of 5 per cent. let the selling price=£105, and for a loss of 10 per cent. let the selling price=£90.

Then 105 : 90 :: £7. 17s. 6d. : £6. 15s. 0d.

[SPECIMEN PAGE]

84. A ladder 25 ft. long stands upright against a wall; find how far the bottom must be pulled out from the wall so as to lower the top 1 foot.

85. A ladder 26 ft. long stands upright against a wall; find how far the bottom of the ladder must be pulled out to lower the top 2 ft.

86. If the diagonal of a rectangular field is 100 yards, and one side is 80 yards, what is the area?

87. The area of a chess board having 6 squares along each side is 108 sq. inches. Find, to six places of decimals, the length of a side of one of these squares.

88. At 10s. a rod, what is the difference in the cost of fencing a field 20 rods square and another field containing the same area which is 40 rods long?

89. Find the square root of the third power of ·6 correct to four places.

90. Raise ·015 to the third power, and extract the square root of the power.

91. A room is half as wide as high, and twice as long as wide. If the floor contains 3362 sq. ft., what is the cost of papering the walls at 9d. per sq. yd.?

92. There are two rectangular fields of equal area. One is $\frac{1}{3}$ mile long and 990 ft. broad, and the other a square. Find the length of a side of the square.

93. Extract the square root of ·000003330625.

94. A rectangular piece of ground 9 acres 1 r. $16\frac{1}{3}$ per. is $\frac{1}{3}$ as broad as long. What is the distance round it, and from one corner to the opposite?

95. Two trees stand on opposite sides of a stream 10 ft. wide. The height of the tree is to the width of the river as 8 : 4, and the width of the stream is to the height of the other tree as 4 : 5. What is the distance between their tops?

96. Prove by the ordinary method that $2\cdot7\dot{6}=\sqrt{7\cdot6\dot{5}\dot{4}}$.

97. Assuming that $\sqrt{\text{area of circle} \div 3\frac{1}{7}}$ will give the radius, find the radius of a circle containing 17 sq. ft. 16 sq. in.

98. The area of a circle is said to be the square of the radius multiplied by 3·14159. Supposing a circular pond to contain $2\frac{1}{2}$ acres, what is its diameter?

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ARITHMETIC FOR SCHOOLS

BY THE

REV. J. B. LOCK, M.A.

SENIOR FELLOW AND BURSAR OF GONVILLE AND CAIUS COLLEGE, CAMBRIDGE
FORMERLY MASTER AT ETON

London
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The present reprint **January 1899** has been carefully revised (see pp. 164, 180, 318 (i)).

It should be noticed that the 400 **Miscellaneous Examples** are, on the average, more difficult and **require more work** than the Examples for Exercise; they are intended to be used as home exercises for fairly advanced students. Many of them do not 'come out neatly,' and the last hundred are difficult questions in the working of which the Student will find an opportunity of testing his knowledge of the theory of approximation and of practising methods of abbreviation.

The **Mental Exercises** which are scattered throughout the book are intended to accustom the pupil as to the *language* of the subject and should be worked with as little help from the pen as possible.

I would again call attention to the importance of the **notation**, $\frac{£4.\ 7s.\ 6d.}{£3.\ 8s.\ 9d.}$ to express the **ratio** of £4. 7*s.* 6*d.* to £3. 8*s.* 9*d.*; this notation is now thoroughly recognised as Arithmetical and will be found admirably adapted to modern methods of ratio.

It is hoped that the multiplicity of Examples will not tempt teachers to use this book for purposes of practising their pupils in mere *unreasoning* calculation. Arithmetic should be studied from all of the following points of view :

(1) As the means of rapid and accurate calculation.

(2) As the instrument by which those engaged in practical science may work out their results to any required degree of approximation.

(3) As a preliminary part of Mathematics, exercising accurate thought and ingenuity, and demanding sound logical treatment.

I venture to call attention to the **Key and Companion** to this Edition ; in it I have endeavoured to shew the working of the more difficult questions in a manner which may render it useful to Teachers and to Students without being a temptation to indolent Schoolboys.

The **Examples** (nearly 8000 in all) have now been published in a separate volume.

When a star* is prefixed to an article or to a question, it is intended to suggest that what follows is of some exceptional difficulty and may therefore be in some cases omitted on a first reading of the book.

As in the first Edition so in the revised edition I have to express my obligations to the Rev. H. C. Watson, M.A., of Clifton College, for very valuable advice and criticism ; to him the book owes many of its best methods and the removal of many blemishes.

The following points may be noticed :—

I. The **metric system** is introduced directly after English weights and measures, and examples are given which can be worked without any special reference to decimals. See pages 58 to 66.

II. For **advanced pupils** pp. 70, 71, 79, 80, 81, will be found very useful.

III. The **examples on vulgar fractions** are very numerous. It may be pointed out that in the text a number such as 18 is never struck out or "cancelled" (see p. 99) thus ~~1~~8, but thus ~~18~~.

IV. The **notation** (p. 109) for concrete fractions $\frac{£4.\ 10s.}{£2.\ 15s.}$ will be found to be of very great importance. The "dot method" of expressing a ratio

or fraction has practically fallen into disuse, and in many modern Arithmetics the idea of ratio is almost entirely lost sight of. But no student can be considered to have grasped the fundamental principle of arithmetic who does not understand the idea of ratio.

The **Unitary Method** is an admirably simple way of solving problems, and is carefully explained (see pages 193 to 198). But it is also most useful for the purpose of leading up to the fundamental principle of Arithmetic, namely that of ratio. It will be found that the old method taught in Colenso and known as the "dot method," which is the method of ratio, can be easily translated into the unitary method and *vice versâ*. The first is only an abbreviation of the second. See Arithmetic, Chapter X., and particularly pages 198, 200, 204, 205.

V. **Percentage** is taught in a very full and graduated way, p. 217, etc.

VI. **Separate examples** are given for interest for a given number of *days*; see p. 227, and generally, the Chapter on Interest and Discount is very full and complete.

VII. Compare Articles 125A, 181B, 183A.

VIII. Note Example iii., p. 248. This example illustrates the fundamental idea of Arithmetic. Almost every purely arithmetical question is answered by finding the **ratio** which the quantity required bears to some given quantity.

IX. Note Example v. p. 256. A similar remark (viii.) applies here.

X. Examples are given of the different Scales of Temperature; p. 260.

XI. And of the Percentage Composition of Chemical Compounds; p. 262.

XII. The method of teaching **Profit and Loss** is new. See Exercise CXXIIIB, and Examples on pp. 267, 268.

XIII. On p. 304 will be found a very concise explanation of **Horner's Method** applied to each Root, etc.

XIV. **The four hundred Examples**, p. 319, called Miscellaneous Examples, require considerable calculation and are intended as a help in the preparation for the modern style of examination in which some of the questions do *not* come out neatly. While in the Examples for Exercise will be found a thousand examples carefully graduated, most of which are short and neat in the working. The last hundred are problems requiring some little thought and skill.

XV. Perhaps the most important point in the book is the attempt to explain the **Theory of Approximation** in Chapter viii. This, for students of practical science, is of very great importance. See particularly pp. 161 to 165, and 171, 172.

XVI. In connection with Approximation particular attention should be directed to Article 137A, and students should be encouraged to work all practical questions concerning money, in **decimals of £1.** See

Examples ii. to iv. on pp. 172, 173; Example ii. p. 237; Example ii. p. 245; Example iii. p. 248.

XVII. As regards the whole of the higher part of the book, while the methods are all based on the **unitary method**, the Author has endeavoured to lead the student carefully on to the idea of *ratio*. Thus the working of every question may, by the interpolation of the step called **reduction to unity**, be translated into the Unitary Method; as is seen in the Examples on Discount, Profit and Loss, and Stocks.

XVIII. As regards the early part of the book, the method of **Complementary Addition** will, it is hoped, some day be generally adopted in the elementary teaching in England, as it is on the Continent; so that the Italian method of division will replace the comparatively clumsy English method. See Articles 20, 23, 31, 36.

XIX. The **method of multiplication** by which the digits of the highest denomination in the multiplier are treated first, is well worth the consideration of Teachers. It is clearly the most scientific method, and it leads up to the idea of Approximation. It is, however, perhaps doubtful how far students who are familiar with the old method should be made to change either their method of division or of multiplication, and it is not insisted on in the book.

The "Arithmetic for Schools" is in use in the following Schools and Colleges:—Eton; Westminster; Clifton; Tonbridge School; Shrewsbury; Brighton College; Highgate School; Leys School, Cambridge; Fettes College, Edinburgh.

At the following Training Colleges:—Brighton; Glasgow, Church of Scotland; Bangor; Battersea; Wandsworth; Chelsea; Stockwell.

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rhòs College; Crewe, The Academy; Dawlish, West Cliff House School; Deal, The College; Dedham, Grammar School; Derby, Spondon House School; Devonport, H.M.S. *Lion*; Dublin: Blackrock College, and Alexandra College; Dunfermline, High School; Easingwold, Grammar School; Eastbourne, Southdown College; Eccles, Modern School; Edinburgh: The Academy, and Cargilfield School; Elgin, The Academy; Elmham, Norfolk County School; Ely, King's School; Epsom, The College; Falkirk, High School; Fochabers, Milne's Institution; Forfar, The Academy; Framlingham, The College; Gateshead, Gateshead School; Glasgow: Technical College, Allen Glen's School, Newton Terrace School, Girls' Grammar School, and The Academy; Glenalmond, Trinity College; Gosport, Collegiate School; Grange-over-Sands, Preparatory School; Gravesend, Proprietary School, Greenock, Kilblain Academy; Grimsby, St. James's College; Hastings: University School, and Hurst Court; Helensburgh, Larchfield Academy; Hereford, Cathedral School; Heversham, Grammar School; Horsham, Grammar School; Huddersfield, Technical School; Hurstpierpoint, St. John's College; Ilminster, Grammar School; Ipswich, Middle School for Boys; Kenley, Beaumont School; Kidderminster, Grammar School; Kingston: Elmhurst School, and Tiffin's Boys' School; Lancaster, Grammar School; Leeds: Central Higher Grade School, and Woodhouse Grove School; Leicester, Wyggeston Boys' School; Lincoln, Northgate School; Liverpool: Waterloo High School, Warbreck College, Parkfield School, and Sandholm, Waterloo; Londonderry, Foyle College; Lurgan, The College; London: City Central Foundation School, E.C., London Institution, E.C., School for Sons of Missionaries, Blackheath, St. Dunstan's College, Catford, Aske's School, Hatcham, Wilson's Grammar School, Camberwell, Roan Girls' School, Greenwich, Alleyne's School, Dulwich, United Westminster School, Victoria Street, S.W., Tooting College, S.W., Haberdashers' School, Hoxton, N., High School, Willesden, N.W., Technical School, Peckam, S.E., Penywern House College, Earl's Court, S.W., Polytechnic Middle School, Regent Street, W., and Polytechnic Institution, Regent Street, W.; Malvern (Great), Greville House School; Marlborough, Grammar School; Monmouth, Grammar School; Montrose, Technical College; Newcastle-on-Tyne, Rutherford College; Newcastle (Staff.), High School; Nottingham, Baptist College; Oxford: High School, St. Kenelm's College, and School House, Crick Road; Perth: The Academy, and Sharp's Institution; Plymouth, Mannamead School; Probus, Grammar School; Portsmouth, Buckingham Place Academy; Ramsgate, St. Augustine's College; Red Hill, Royal St. Anne's School; Retford (East), Grammar School; Rottingdean, The School; Ruabon, Grammar School; Saltburn, Collegiate School; Sedbergh, Grammar School; Sheffield, Central Higher Grade School; Shildon, Friend's British School; Silcoates, Northern Congregational School; St. Andrews, St. Leonard's School; St. Asaph, Grammar School; St. Bees, Grammar School; St. Kitt's, B.W.I., Grammar School; St. Leonards: Maze Hill School, and Winchester House School; Sandwich, Grammar School; Storrington, The Forge School; Sunderland, The Hall School; Swansea, St. Andrew's College; Taunton, The Huish School; Tipperary, Christian School; Torquay, Torbay College; Twickenham, King's College; Warwick, King's School; Waterford, Ursuline Convent School; Watford, London Orphan Asylum; Weybridge, St. George's College; Windsor, St. Mark's School; Winchester, Wellington House School; Woodford, Bancroft School; Yarm-on-Tees, Grammar School; Yarmouth, Grammar School.

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AN ARITHMETIC

FOR SCHOOLS

BY

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SOMETIME FELLOW OF SIDNEY SUSSEX COLLEGE, CAMBRIDGE

London

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Answers to the Examples.

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portant chapters there is a set of miscellaneous examples ; which will be found of great value to students. The answers are placed at the end of the book, which appears to have been compiled with great care, and is well adapted for the purpose the author had in view."

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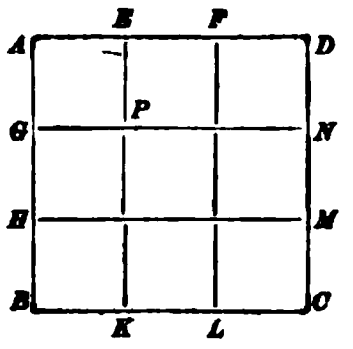
MEASURES OF SURFACE.

122. A square is a four-sided figure all of whose sides are equal, and such that each side is at right angles to the two adjacent sides.

Thus the annexed figure is a square in which the four sides AB, BC, CD, and DA are all equal, and the angles A, B, C, and D are all right angles.



A square yard is a square such that each of its sides is one yard in length.

Similarly a square foot, inch, etc., is a square whose side is a foot, inch, etc., in length.

Let $ABCD$ be a square yard, so that $AB = AD = 1$ yard.

Take E, F, G, H, K, L, M, and N points in the sides, such that $AE = EF = FD = 1$ foot, $AG = GH = HB = 1$ foot,

$BK = KL = LC = 1$ foot, and $CM = MN = ND = 1$ foot.

Join these points as in the figure by straight lines; we thus get nine equal figures such as $AGPE$. Since $AG = GP = PE = EA = 1$ foot, the figure $AGPE$ is a square foot.

Thus the figure $ABCD$ is equal to 9 square feet, that is, a square yard is equal to 9 square feet.

Similarly, if we took a square foot and divided each side into 12 parts and drew straight lines as above, we should see that a square foot is equal to 12×12, that is, 144 square inches.

123. The following is the ordinary table of

SQUARE MEASURE.

144 Square Inches (Sq. Ins.)	**make**	**1 Square Foot** (Sq. Ft.).
9 Square Feet	„	**1 Square Yard** (Sq. Yd.).
30¼ Square Yards	„	**1 Square Pole** (Sq. Po.).
40 Square Poles	„	**1 Rood** (R.).
4 Roods	„	**1 Acre** (Ac.).
640 Acres	„	**1 Square Mile** (Sq. Mi.).

In addition, since 1 chain = 22 yards,

we have 1 square chain = 22×22 sq. yards = 484 sq. yards.

But 1 acre = 4 roods = 160 sq. poles

= $160 \times 30\frac{1}{4}$ sq. yards = 4840 sq. yards = 10 sq. chains.

Hence we have 10000 sq. links = 1 sq. chain,

and 10 sq. chains = 1 acre.

6384 seven times. Remembering that the figures cut off, when multiplied by 7, would have caused a "carried" figure 3, we set down 6016 instead of 6013.

The remainder is now 368.

Cutting off the 9 of the divisor and altering the 5 into a 6 (because 59 is nearer to 60 than 50), we have 86 as the final divisor. Also 86 divides into 368 four times. The whole process may be written as in the margin.

```
85|9|4|3|2 ) 6489350 ( ·755074
             6016024
             ------
              4733260
              4297160
              -------
               436100
               429716
               ------
                 6384
                 6016
                 ----
                  368
                  344
                  ---
                   24
```

251. We see that in the previous work we should arrange so that the last curtailed divisor should consist of two digits (such as the 86). We should therefore commence the curtailing of the divisor at that stage of the work *where the number of figures still to be found in the quotient is just two less than the number of the digits in the divisor.*

For, since we cut off one digit from the divisor for each further place found in the quotient, it is clear that if we begin the curtailing at the stage given by the above rule we shall always have two figures left in the divisor at the last division.

Ex. 1. *Find the value, to four places of decimals, of*

$$3749{\cdot}62357 \div 97{\cdot}43725164.$$

Since 97 divides into 3749 between 30 and 40 times there will be two places of whole numbers in the quotient. Hence we have to find the first six figures of the quotient, and we know that the decimal point comes after the first two of these figures.

Moving the decimal point eight places to the right in each, we have

9743725164) 374962357000 (

Since we only have to find six figures in the quotient, we need only commence with the first eight (6 + 2) figures of the divisor. We therefore cast out the right-hand pair of digits in both the preceding divisor and dividend.

```
97|4|3|7|2|5|1 ) 3749623570 ( 38·4824
                  29231175
                  --------
                   8265060
                   7794980
                   -------
                    470080
                    389749
                    ------
                     80331
                     77950
                     -----
                      2381
                      1949
                      ----
                       432
                       390
                       ---
                        42
```

Ans. = 38·4824.

37. Find the expense of turfing a piece of ground which is 40 yards long and 100 feet wide, with turfs, each a yard long and a foot wide, their cost being 6*s.* 9*d.* a hundred.

38. How much turf will be required to cover a rectangular plot of ground which consists of a lawn-tennis court (26 yards by 12) and a margin of $3\frac{1}{2}$ yards at each end and 4 feet at each side? Find also the cost at 4*s.* 6*d.* per square pole.

39. The floor of a room 17 ft. 6 in. long by 16 ft. 3 in. wide is to be covered with tiles at £2. 5*s.* per thousand, the size of a tile being 3 inches by 5 inches; what is the cost of the tiles?

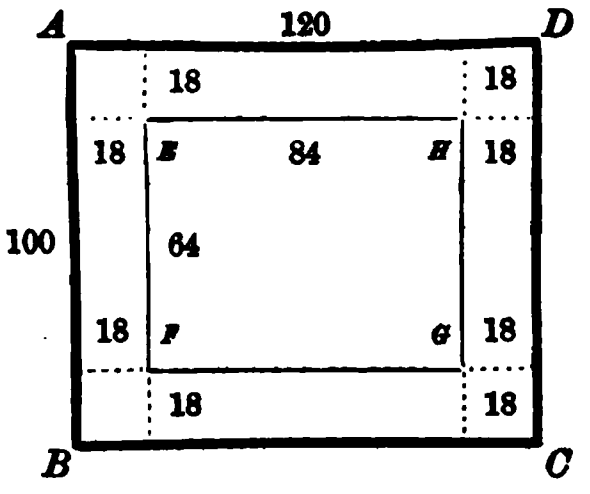
40. How many tiles, $4\frac{1}{2}$ inches by 6 inches, will be required to cover a floor 18 feet long by 13 ft. 6 in. broad, and what is their cost at 3*s.* 4*d.* per dozen?

41. It is found that 1296 bricks (the exposed surface of each brick measuring $9\frac{1}{2}$ inches by $4\frac{1}{2}$ inches) have been employed in paving a certain court-yard; how many tiles, each 9 inches square, will be required for a pavement one-ninth of the size?

42. *A rectangular court-yard is* 120 *feet long, and* 100 *feet wide; around the court-yard is a gravel path,* 18 *feet wide, and the rest of the court is a grass plot: find the area of the grass plot, and also that of the gravelled portion.*

Let $ABCD$ be the courtyard, and $EFGH$ the boundary of the grass plot.

Then EF is less than AB by twice the width of the gravel, that is, by twice 18 feet.



$\therefore$ $EF = AB - 2 \times 18 = 100 - 36 = 64$ ft.

So $EH = 120 - 2 \times 18 = 120 - 36 = 84$ ft.

The area of the grass plot therefore

$= 84 \times 64$ sq. ft. $= 5376$ sq. ft.

The area of the whole courtyard

$= 120 \times 100$ sq. ft. $= 12{,}000$ sq. ft.

Hence the area of the gravelled portion $= 12{,}000 - 5376 = 6624$ sq. ft.

43. What will it cost to make a gravel walk 7 feet wide along the inner edge of each side of a square field, whose side is 110 yards long, at 1*s.* 6*d.* per sq. yard?

44. Find the expense of paving a pathway 6 feet wide round and immediately outside a lawn, 21 yards long and 10 yards broad, at $9\frac{1}{2}d.$ per sq. yard.

45. A rectangular court is 120 feet long and 90 broad, and a path of the uniform width of 10 feet runs round it and inside it; find the cost of covering the path with flagstones at 4*s.* 6*d.* per sq. yard, and the remainder with turf at 3*s.* 3*d.* per 100 sq. feet.

274. Carpeting of Rooms. Most carpets are made in one long continuous piece, and when a carpet of given size has to be made for a room, a sufficient length has to be cut off from the roll of carpet. In some cases it is necessary to find

Line (3) is $\frac{1}{400}$ of line (1), and is obtained by dividing line (1) by 4, and setting down the result two decimal places to the right.

Similarly for the rest of the work.

Since we only require four decimal places in the answer, all the figures to the right of the vertical line might have been omitted.

Ex. 2. *Find the amount of* £567. 11*s.* 7*d. in* 3 *years at* $3\frac{13}{16}$ *per cent. per annum.*

By Art. 258, £567. 11*s.* 7*d.* = £567·57916̇.

Also $3\frac{13}{16} = 3 + \frac{8+4+1}{16} = 3 + \frac{1}{2} + \frac{1}{4} + \frac{1}{16}$

$$\therefore\ 1 + \frac{3\frac{13}{16}}{100} = 1 + \frac{3}{100} + \frac{1}{200} + \frac{1}{400} + \frac{1}{1600}$$

$$= 1 + \frac{3}{100} + \frac{1}{200} + \frac{1}{2}\left(\frac{1}{200}\right) + \frac{1}{4} \times \left(\frac{1}{2} \times \frac{1}{200}\right).$$

$$3\frac{13}{16}\,\% \begin{cases} 3\,\% = \cdot 03 \\ \frac{1}{2}\,\% = \frac{1}{6} \text{ of } 3\,\% \\ \frac{1}{4}\,\% = \frac{1}{2} \text{ of } \frac{1}{2}\,\% \\ \frac{1}{16}\,\% = \frac{1}{4} \text{ of } \frac{1}{4}\,\% \end{cases}$$

£		
567·5791	6...	.....(1)
17·0273	748	.....(2)
2·8378	958	.....(3)
1·4189	479	.....(4)
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18·3504	60	
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1·5292	0	
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635·0024		
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·0480		
12		
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Ans. = £635. 0*s.* $0\frac{3}{4}$*d.*

Line (2) is $\frac{3}{100}$ of line (1), and is obtained by multiplying it by 3 and setting down the result two places to the right.

Line (3) is $\frac{1}{200}$ of line (1), and is obtained by dividing it by 2 and setting down the work two places to the right. [It may also be obtained by dividing line (2) by 6.]

Line (4) is $\frac{1}{2} \times \frac{1}{200}$ of line (1); that is, $\frac{1}{2}$ of line (3), and is obtained by dividing line (3) by 2.

Similarly line (5) is $\frac{1}{4} \times \left(\frac{1}{2} \times \frac{1}{200}\right)$ of line (1), and is thus $\frac{1}{4}$ of line (4).

Similarly the rest of the work follows. It is clear that, as before, the figures to the right of the vertical line are unnecessary.

353. If the interest be supposed to be added on to the principal half-yearly, the amount in a given number of years is the same as in twice that number of years at half the given rate per cent. Thus the amount of £100 in 4 years at 5 % per annum, payable half-yearly, is the same as that of £100 in 8 years at $2\frac{1}{2}$ % per annum, and is therefore obtained by multiplying £100 by 1·025 eight times in succession.

[SPECIMEN PAGE]

it is said to be **'at a premium."** When the selling price is less than 100, that is, when the Stock would sell for less than was originally subscribed, it is said to be **"at a discount."** When the price is exactly 100 the Stock is said to be **"at par."**

Thus in the examples of Art. 370, London and North-Western Railway Stock is "at a premium of 108 per cent."

Great Eastern Stock is at "a premium of 21 (that is, 121 – 100) per cent.," and London, Chatham and Dover Railway Stock is "at a discount of 79 (that is 100 – 21) per cent."

374. Any quantity of Stock, excluding fractions of a penny, can be bought or sold. Thus we could buy "£137. 6*s.* 7*d.* of London and N.-W. Stock." This expression means *not* "that which costs in cash £137. 6*s.* 7*d.*," *but* "that for which £137. 6*s.* 7*d.* was originally subscribed."

375. The expression "£100 of Stock" thus means that quantity of Stock of which the *nominal* value is £100, that is, that quantity of the Stock which originally cost £100. It does not mean that quantity of Stock which would sell for £100. This point must be carefully noted by the student. *Its neglect is the cause of most of the difficulties found in questions on Stocks.*

376. Sometimes the capital of a company is not spoken of as so much Stock, but it is instead divided into shares, each of some given value. Thus the capital of a company may consist of 200,000 shares, each of £10. In this case only a whole number of shares can be bought or sold.

377. There is another kind of Stock besides the Stocks which form the capital of commercial companies, that is, of companies formed for the object of making profits.

Almost all Governments (and also many cities and towns) have borrowed money. These Governments have often applied these monies in paying for the execution of works of public utility. Still more often, unfortunately, the money has been borrowed for the purpose of carrying on wars, or paying the expenses of wars. Thus, for some reason or other, almost every Government has a Public Debt on which it pays Interest.

In some cases the Governments have fixed a time, or times, at which its debt should be repaid or redeemed; in many cases, however, there is no such time fixed.

378. British Public Debt. Consols. The main portion of the British Public Debt consists (1897) of a sum of

[SPECIMEN PAGE]

16. *A* and *B* run a race; *A* starts at the rate of 400 yards a minute, and at the end of each minute diminishes his pace by 20 yards a minute. *B* increases his pace at the same rate, and catches *A* at the end of six minutes; at what pace did *B* start?

17. *A* and *B* run a race. *A* starts at the rate of 400 yards a minute, but in each successive minute increases his pace by a yard per minute; *B* diminishes his pace at the same rate, and is overtaken by *A* in 4 minutes; what was *B*'s pace at first?

18. In a bicycle race of 5 miles *A* gives *B* 400 yards and *C* 750 yards start. If their respective speeds be uniform, and as 25 : 24 : 23, in what order will they reach the goal?

19. *A gives B 49 yards start in a race of one mile, and is beaten by 20 yards; how many yards ought A to have given B?*

Since *A* is beaten by 20 yards the distance he has run

$$= 1760 \text{ yards} - 20 \text{ yards} = 1740 \text{ yards}.$$

Now the distance *B* has run = 1760 yards − 49 yards = 1711 yards.

$\therefore$ *A* runs 1740 yards whilst *B* runs 1711 yards;

$\therefore$,, 1 yard ,, $\frac{1711}{1740}$ $\left(=\frac{59}{60}\right)$ yard;

$\therefore$,, 1760 yards ,, $\frac{59}{60} \times 1760$, that is, $1730\frac{2}{3}$ yards.

Hence the start that *A* can give $B = \left(1760 - 1730\frac{2}{3}\right) = 29\frac{1}{3}$ yards.

20. *A gives B 4 yards start in a race of 100 yards and is beaten by 1 yard; he gives C a start of 7 yards in a race of the same distance and wins by 1 yard: how much start could B give C in a race of 800 yards in order to just make a dead heat, the rates of running in each case being supposed to be always the same?*

In the first race *B* runs a distance of 100 − 4, that is, 96 yards.

A being beaten only runs 99 yards in the same time;

$\therefore$ *A* runs 99 yards whilst *B* runs 96 yards;

$\therefore$,, 1 yard ,, $\frac{96}{99}$, that is, $\frac{32}{33}$ yard. .....(1)

In the second race *C* has only 93 yards to run, and he is beaten by 1 yard, so that he runs 92 yards only;

$\therefore$ *A* runs 100 yards whilst *C* runs 92 yards;

$\therefore$,, 1 yard ,, $\frac{92}{100}$, that is, $\frac{23}{25}$ yard. .....(2)

From (1) and (2) we see that

B runs $\frac{32}{33}$ yard whilst *C* runs $\frac{23}{25}$ yard;

$\therefore$,, 1 yard ,, $\frac{23}{25} \times \frac{33}{32}$, that is, $\frac{759}{800}$ yard;

$\therefore$ *B* runs 800 yards whilst *C* runs 759 yards;

$\therefore$ the start that *B* could give to *C* = 800 − 759 = 41 yards.

21. *A* can give *B* 5 yards and *C* 6 yards in a 100 yards' race; if *B* give *C* one yard start in a 100 yards' race, which would win?

22. At a game of billiards *A* can give *B* 10 points in a game of 100, and he can give *C* 15 points in the same number; how many points can *B* give *C* in a game of 200?

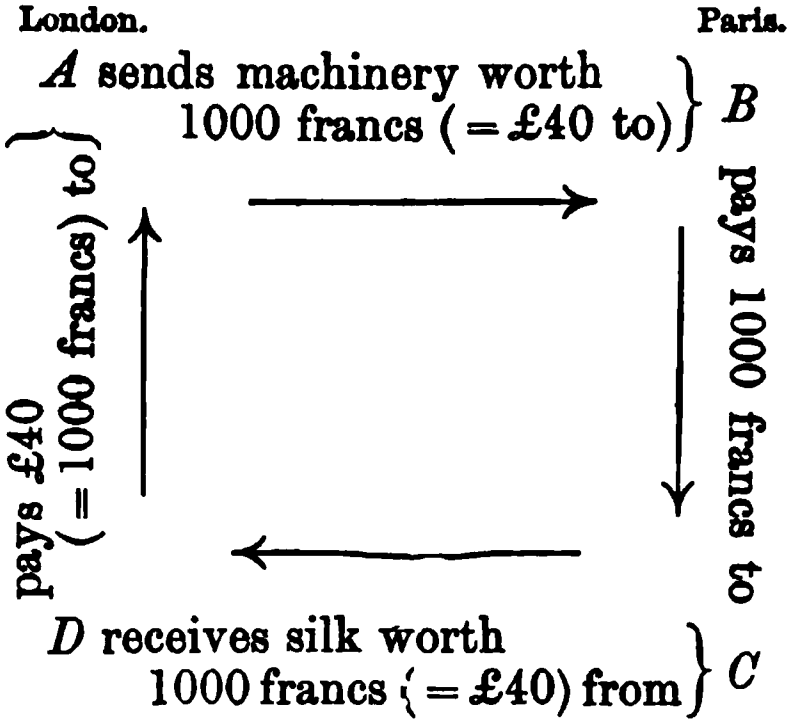
23. At a game of billiards *A* can give *B* 15 points in 50, and he can give *C* 32 in 80; how many can *B* give *C* in a game of 70?

461. Foreign Exchanges. Suppose that an English merchant, *A*, sells machinery to a Frenchman, *B*, in Paris, for which he charges the latter 1000 francs. One way of settling the debt would be for *B* to send *A* 1000 francs. But this method of settling the debt would be inconvenient, both because of the expense of actually sending cash, and also because the amount of coin required in the course of trade would be considerably greater than the amount which is actually in existence.

Suppose, now, that a second Frenchman, *C*, sells to a second Englishman, *D*, silk for which he charges *D* £40 (=1000 francs).

If, then, *D* were to pay 1000 francs (or its equivalent in English money, say £40) to *A*, and *B* were to pay 1000 francs to *C*, the two transactions would be completed, and each of the four persons, *A*, *B*, *C*, and *D*, would have that to which he is entitled.

The transaction would then stand as follows:



The two sales would then have been completed without any transference of money across the Channel.

462. In actual practice it would be inconvenient, and perhaps impossible, for *B* to find a person, *C*, who required *from* London exactly the same sum of money which *B* owed *to* London. This inconvenience would be overcome if the business were performed through a banking house that has branches both in London and in Paris.

In the above case *A* would draw a bill on *B* for 1000 francs (=£40, say), and *B* would accept it.

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IN

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B give
28. At a
give *C* 32 in 80;

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FROM THE PREFACE TO THE SIXTH EDITION

"In the following pages I have endeavoured to reason out in a clear and accurate manner the leading propositions of the science of Arithmetic, and to illustrate and apply those propositions in practice. In the practical part of the subject I have advanced somewhat beyond the majority of preceding writers; particularly in Division, in Greatest Common Measure, in Cube Root, in the chapters on Decimal Money and the Metric System, and more especially in the application of Decimals to Percentages and cognate subjects. So long as the mania for *neat* answers continues to exist, so long will Decimals fail to take their legitimate place in the class-room, and be relegated to the office and the counting-house. The chapter on Weights and Measures and the Metric System is longer than usual, but not I hope uninteresting. In the earlier part of the work I have used the method of Reduction to the Unit, but I am far from advising an exclusive adherence to that method; when the student has gained a clear and firm grasp of ratio, it would be unwise of him to neglect the powerful instrument that has come into his possession."

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[SPECIMEN PAGE]

hence (108) we have this Rule,—*Divide in the usual way, and to the integral quotient add the fraction whose numerator is the remainder, and denominator the divisor.*

COR. Since $29 \div 8 = \frac{29}{8}$ we shall use either notation indifferently.

Ex. 1. Divide 868 by 37.

$$\begin{array}{r|l} 37 & 868\,(\,23 \\ & 128 \\ & 17 \end{array}$$

therefore $868 \div 37 = 23\frac{17}{37}$.

134. *To divide any number by a fraction.*

For example divide $\frac{3}{4}$ by $\frac{5}{7}$. Here we have to find a quotient which when multiplied by $\frac{5}{7}$ shall give the product $\frac{3}{4}$; hence (128)

$\frac{5}{7}$ of this quotient is equal to $\frac{3}{4}$;

therefore $\frac{1}{7}$ ..... $\frac{3}{4} \div 5$ or to $\frac{3}{4 \times 5}$,

and therefore this quotient..... $\frac{3}{4 \times 5} \times 7$ or to $\frac{3 \times 7}{4 \times 5}$;

but $\frac{3 \times 7}{4 \times 5} = \frac{3}{4} \times \frac{7}{5}$; (127)

therefore $\frac{3}{4} \div \frac{5}{7} = \frac{3}{4} \times \frac{7}{5}$.

Or we may proceed thus:

quotient $\times \frac{5}{7} = \frac{3}{4}$ by definition;

multiply each term of this equality by $\frac{7}{5}$,

therefore quotient $\times \frac{5}{7} \times \frac{7}{5} = \frac{3}{4} \times \frac{7}{5}$,

or $\frac{5}{7} \times \frac{7}{5} \times$ quotient $= \frac{3}{4} \times \frac{7}{5}$, (130)

that is quotient $= \frac{3}{4} \times \frac{7}{5}$;

the same result as before; that is, to divide a number by $\frac{5}{7}$ we multiply the number by $\frac{7}{5}$; but $\frac{7}{5}$ is the *reciprocal* of $\frac{5}{7}$; hence to divide a number by a fraction we have this Rule :—

Multiply the number by the reciprocal of the Divisor.

[SPECIMEN PAGE]

Ex. 3. If 16 cannon firing 4 rounds in 7 minutes kill 270 men in an hour and a half, how many cannon firing 8 rounds in 9 minutes will kill 420 men in 40 minutes?

cannon.	rounds.	min.	men.	hours.
16	4	7	270	$1\frac{1}{2}$
cannon reqd.	8	9	420	$\frac{2}{3}$

If the number of rounds be *increased*, the number of cannon will be *decreased*—proportion inverse.

If the interval between each round be *increased*, the number of cannon will be *increased*—proportion direct.

If the number of men to be killed be *increased*, the number of cannon will be *increased*—proportion direct.

If the time during which the cannon fire be *increased*, the number of cannon will be *decreased*.

Therefore stating as directed in the last example, we have

$$\left.\begin{array}{rcl} 8 & : & 4 \\ 7 & : & 9 \\ 270 & : & 420 \\ \frac{2}{3} & : & \frac{3}{2} \end{array}\right\} = 16 \text{ cannon : cannon required;}$$

$$\therefore \text{ cannon required} = 16 \times \frac{4 \times 9 \times 420 \times \frac{3}{2}}{8 \times 7 \times 270 \times \frac{2}{3}}$$

$$= 36.$$

Ex. 4. A garrison of 4500 men is supplied with provisions for 15 weeks at the rate of 13 oz. per day per man: how many men must leave that the same provisions may supply those that remain 27 weeks at 10 oz. per day per man?

Here we must find how many men the provisions will supply on the second hypothesis.

men.	weeks.	oz.
4500	15	13
men required	27	10

If the number of weeks be *increased*, the number of men must be *decreased*—proportion inverse.

If the number of ounces per day be *increased*, the number of men must be *decreased*—proportion inverse:—hence

$$\left.\begin{array}{rcl} 27 & : & 15 \\ 10 & : & 13 \end{array}\right\} = 4500 \text{ men : men required;}$$

$$\therefore \text{ men required} = 4500 \times \frac{15 \times 13}{27 \times 10} = 3250;$$

$$\therefore \text{ no. of men that must leave} = 4500 - 3250 = 1250.$$

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PREFACE

"In revising the text of this work care has been taken to give the reason before the rule, in the belief that this simple transposition will increase its educational usefulness. No rule has been omitted. Additions have been made, especially under the heads of Notation, Subtraction, Division, Greatest Common Measure, Approximations, Ratio, Percentage, and Surds. The simplified explanation of Subtraction, with the wording recommended by De Morgan, not only greatly facilitates the process of Subtraction, but is an essential step to the new Division. It is quite as easily learnt by a beginner as any other method, though habit may throw a difficulty in the way of its adoption by those who are not beginners. Teachers are strongly recommended to overcome this difficulty for the sake of their pupils.

"The Tables of Weights and Measures have been brought into accordance with the Act of Parliament which legalised the Metric System. Examples have been given on the connection between the Metric and British Units and on the Electrical Units, on account of their growing commercial importance. The section on Surds will, it is hoped, be found useful as an introduction to algebraical ideas without algebraical symbols. Some of the examples worked out in the book have been simplified, additional steps have been inserted, and additional examples exhibiting varieties of method have been introduced. To the already numerous collection of questions, about 1200 exercises and problems, partly original but largely collected from examination papers, have been added. It is by no means necessary for a learner to work all the examples under each head before proceeding; some may advantageously be left for a revision course. Some of the examples are for mental work, but among the problems are included several of appreciable difficulty.

"To facilitate the use of this edition concurrently with older ones, the numbers of the articles and of the old examples remain unaltered, new articles are distinguished by asterisks, new sets of examples include the word 'Additional' in their headings and are numbered in Arabic figures. Any one happening to meet with errors either in the text or in the examples who will kindly communicate them to the Publishers will confer an obligation upon the Editor."

The Select Committee appointed to enquire whether any, and if any, what, changes in the present system of weights and measures should be adopted, has recommended:—"That the metrical system of weights and measures be at once legalised for all purposes. That after a lapse of two years the metrical system be rendered compulsory by Act of Parliament, and that the metrical system of weights and measures be taught in all elementary public schools as a necessary and integral part of Arithmetic."

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Scotsman—"The work, already recognised as one of the best general text-books of its subject, is in this improved form sure to be more extensively put in use in schools."

Ex. 2. $5{\cdot}34 \times {\cdot}0021$.

Consider $5 \times {\cdot}002$, it is ·01, therefore the answer to the complete multiplication must be about ·01. It is ·011214.

Ex. 3. $41{\cdot}34 \times 24{\cdot}41$.

Here $40 \times 20 = 800$, this shows that the answer to the multiplication cannot be about 100 nor 10091, hence it must be 1009·1094. Or the position of the decimal point may be kept in sight by writing the units figure of the multiplier under the lowest digit of the multiplicand, and beginning to write each partial product under its multiplier, writing the decimal point where it occurs in multiplying by the units' digit, as this does not change its position; the decimal points will then be in a vertical line: this is an easy practical method.

41·34
24·41
·4134
16·536
165·36
826·8
1009·1094

Superfluous cyphers to the right may be disregarded at once.

Ex. 4. $4{\cdot}325 \times 6{\cdot}08$.

Ex. 5. ·0124 × ·0425.

It is best to begin with the left hand or most important digit of the multiplier.

·325	·0124
6·08	0·0425
1·95 ·	·000496
25 · ·	248
1·975	62 ·
	·000527 ·

Ex. XXVII.

1. Multiply together:

(1) 3·8 and 42; ·38 and ·42; 3·8 and 4·2; ·038 and ·0042.

(2) 417 and ·417; ·417 and ·417; 71956 and ·000025.

(3) 2·052 and ·0031; 4·07 and ·916; 476 and ·00026.

2. Multiply (proving the truth of the result in each case)

(1) 81·4632 by ·0378. (2) 27·35 by 7·70071. (3) ·04375 by ·0754.

3. Find the product of

(1) ·0046 by 7·85. (2) ·00846 by ·00324. (3) ·314 by ·0021

(4) ·009 by ·00846. (5) ·009207 by 6·056. (6) ·00948 by 29; proving the truth of each result.

4. Find the continued product of 1, ·01, ·001, and 100; also of ·12, 1·2, ·012, and 120; and prove the truth of the results.

5. Find the value of (1) $7{\cdot}6 \times {\cdot}071 \times 2{\cdot}1 \times 29$.

(2) $·007 \times 700 \times 760{\cdot}3 \times {\cdot}00416 \times 100000$.

TABLE OF COAL MEASURE.

107. This measure is not used now, as coals are sold by weight.

Formerly,
4 Pecks ..... made 1 Bushel.
3 Bushels ..... 1 Sack.
12 Sacks or 36 Bushels 1 Chaldron.

107*. THE METRIC TABLE OF CAPACITY.

10 Centilitres = 1 Decilitre.
10 Decilitres = 1 LITRE = 1 cubic Decimetre.
10 LITRES = 1 Dekalitre.
10 Dekalitres = 1 Hectolitre.
10 Hectolitres = 1 Kilolitre = 1 cubic Metre.

A Kilolitre of wood is called a Stère ; 10 Stères = 1 Decastère.

MEASURES OF WEIGHT.

TABLE OF AVOIRDUPOIS WEIGHT.

108. Avoirdupois weight derives its name from *Avoirs* (goods or chattels), and *Poids* (weight). It is used in weighing all heavy articles, which are coarse and drossy, or subject to waste, as butter, meat, and the like, and all objects of commerce, with the exception of medicines, gold, silver, and some precious stones. The different units are drams (drs.), ounces (oz.), pounds (lbs.), quarters (qrs.), hundredweights (cwts.), tons (tons). The pound avoirdupois is the Imperial Standard pound.

16 Drams..... make 1 Ounce..... 1 oz.
16 Ounces ..... 1 Pound ..... 1 lb.
14 Pounds ..... 1 Stone ..... 1 st.
2 Stones or 28 Pounds.. 1 Quarter ..... 1 qr.
4 Quarters or 8 Stones.. 1 Hundredweight.. 1 cwt.
20 Hundredweights ..... 1 Ton..... 1 Ton.

Also, 7000 Grains = 1 lb. ; 100 lbs. = 1 Cental ; 1 Firkin of Butter = 56 lbs. ; 1 Fodder of Lead = 19½ cwt. ; 1 Great Pound of Silk = 24 ounces ; 1 Pack of Wool = 240 pounds ; 1 Cubic Foot of Water weighs about 1000 ounces, and is equal to about 6¼ gallons.

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[SPECIMEN PAGE]

13. $\frac{15}{2}$. 14. $\frac{33}{4}$. 15. $\frac{47}{5}$. 16. $\frac{82}{7}$. 17. $\frac{19}{13}$.

18. $\frac{82}{15}$. 19. $\frac{145}{12}$. 20. $\frac{100}{9}$. 21. $\frac{100}{11}$. 22. $\frac{96}{11}$.

23. $\frac{180}{15}$. 24. $\frac{226}{21}$. 25. $\frac{254}{25}$.

EXAMPLES. XVII a. Multiplication.

1. $\frac{3}{4} \times 8$. 2. $\frac{1}{5} \times 10$. 3. $\frac{1}{7} \times 21$. 4. $\frac{1}{9}$ of 27.

5. $\frac{1}{11}$ of 33. 6. $\frac{1}{12}$ of 25. 7. $\frac{2}{15}$ of 30. 8. $\frac{4}{9}$ of 18.

9. $\frac{5}{8} \times 16$. 10. $\frac{3}{8} \times 4$. 11. $\frac{5}{12} \times 3$. 12. $\frac{7}{16} \times 4$.

13. $\frac{9}{25} \times 5$. 14. $\frac{3}{8}$ of 12. 15. $\frac{7}{12}$ of 16. 16. $\frac{1}{18} \times 27$.

17. $\frac{3}{16} \times 24$. 18. $\frac{4}{21} \times 35$. 19. $\frac{8}{33} \times 44$. 20. $\frac{1}{5}$ of $\frac{1}{6}$.

21. $\frac{1}{4}$ of $\frac{1}{7}$. 22. $\frac{1}{8} \times \frac{1}{9}$. 23. $\frac{1}{10} \times \frac{1}{10}$. 24. $\frac{2}{15} \times \frac{5}{8}$.

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Scotsman—"The exercises and questions are well selected, and form an excellent book of discipline in Arithmetic. An Appendix of questions in logarithms and mensuration adds to the value of the work."

PREFACE

IN this book we have followed the same plan as in our *Algebraical Exercises and Examination Papers*: the contents comprise eighty progressive miscellaneous Exercises, followed by a collection of fifty Papers set at recent Examinations, and an Appendix containing miscellaneous examples in Logarithms and Mensuration.

The EXERCISES are arranged as follows:

Part I. includes Decimals, Practice, Simple Proportion, and Simple Interest; Part II. takes in Compound Proportion, Percentages, Averages, and Proportional Parts; in Part III., Square Root, Areas, and Volumes are introduced; Part IV. includes Discount and Compound Interest; Part V., Profit and Loss and Stocks; Part VI., Cube Root and Duodecimals.

The EXAMINATION PAPERS will be found to comprise specimens of papers set at all the most important examinations in which a knowledge of Arithmetic is required.

The APPENDIX now consists of three hundred and fifty graduated questions in Logarithms and Mensuration, arranged in thirty-five papers of ten questions, preceded by a list of numerical constants and formulae in Mensuration.

In the Second Edition the Appendix was increased by a new series of Examples which are intended to be worked by the aid of Logarithmic Tables. In view of the increasing importance of logarithmic calculation in many Examinations this last section will be found especially useful.

6. A grocer sells sugar at 4*d.* per lb. and takes off 5 per cent. for cash payment: find what it costs him per cwt. in order that he may make a profit of 60 per cent.

7. If the discount on a bill due five months hence at $3\frac{3}{4}$ per cent. per annum is £774. 12*s.* 6*d.*, what is the amount of the bill?

8. By selling out 3 per cent. Consols at $102\frac{3}{4}$, and investing the proceeds in a railway stock which pays dividends of 7 per cent. per annum, a man finds that he can double his income: what is the price of the railway stock?

EXERCISE LVIII.

1. A man's yearly income is £566. 13*s.* 4*d.*, and he spends $82\frac{1}{2}$ per cent. of it: how much does he save a year?

2. Reduce 2 miles 7 furlongs 18 perches 3 yards to the decimal of a league.

3. Find the income derived from the investment of £4470 in the $4\frac{1}{4}$ per cents. at $93\frac{1}{8}$.

4. If a postage stamp is an inch long and $\frac{4}{5}$ of an inch broad, how many stamps will be required for papering a room 18 ft. 10 in. long, 16 ft. 9 in. broad, and 9 ft. 6 in. high?

5. Simplify $\dfrac{\frac{13}{111}+\frac{17}{47}}{1-\frac{13}{111}\times\frac{17}{47}} - \dfrac{\frac{17}{15}-\frac{19}{47}}{1+\frac{17}{15}\times\frac{19}{47}}$.

6. It is found that 40 lbs. Troy of standard gold can be coined into 1869 sovereigns, the proportion of pure gold to alloy in standard gold being 22 to 2. How many grains of pure gold are there in a sovereign?

7. A wine-merchant buys whiskey at 17*s.* 6*d.* per gallon, and after adding water to it in the proportion of 1 gallon to 6, retails it at 18*s.* per gallon: what percentage of profit does he make on his outlay?

XXIX.

Cambridge Local Examinations. Junior Students.

December, 1886.

1. There are 57 boxes of rice each containing eight hundred and nine thousand three hundred and nine grains, and 76 other boxes each containing seven hundred and nineteen thousand two hundred and ninety-four grains: write *in words* how many grains of rice there are altogether.

2. How many ounces are there in thirteen times 1 ton 2 cwt. 11 lbs.; and how many inches in 1 mile 2 furlongs 35 poles?

3. What is the whole cost of 5 pairs of gloves at 2*s.* 11$\frac{3}{4}$*d.* a pair, 24 yds. of muslin at 1*s.* 9$\frac{1}{2}$*d.* a yard, 17$\frac{1}{2}$ yds. of ribbon at 8$\frac{1}{2}$*d.* a yard, and 35 yards of flannel at 1*s.* 7$\frac{3}{4}$*d.* a yard?

4. Find by Practice the cost of warming a building for 11 days 17 hours 28 minutes, if the cost is £4. 10*s.* per day.

5. Subtract $4\frac{33}{35}$ from $\frac{1}{6}+2\frac{1}{7}+13\frac{3}{10}+\frac{4}{21}$.

6. Simplify

$$\frac{1664}{1408} \text{ of } \left\{\frac{7}{10} \text{ of } £3\frac{3}{14}+6\frac{2}{3} \text{ of } £3.\ 0s.\ 9d.-4\frac{13}{31} \text{ of } £3.\ 2s.\right\}.$$

7. Multiply ·004 by 32·4, and divide the product by 6·4. Express as a vulgar fraction the product of $\cdot\dot{2}\dot{7}$ and $\cdot 9\dot{1}\dot{6}$.

8. If I pay £2. 7*s.* 8$\frac{1}{4}$*d.* as Income Tax on a rental of £71. 10*s.* 7$\frac{1}{2}$*d.*, what should I pay on a rental of £510. 15*s.*?

9. Find the Compound Interest on £4500 for 2 years at 4$\frac{1}{4}$ per cent. per annum.

10. *C* does half as much in a day as *A* and *B* can do together, and *B* does half as much again as *A*. If all three working together can mow 20 acres of barley in 16 days, how long would each, working by himself, take to mow 5 acres?

11. How much 3 per cent. stock sold at 92$\frac{1}{2}$ will produce £3700? If this sum of £3700 be then invested in Railway Stock at 115$\frac{5}{8}$, what percentage must this stock pay in order that the same income may be received as from the original investment? (No brokerage is to be reckoned.)

12. A rectangular field which is twice as long as it is wide costs 1·0138*s.* per square yard to turf. If the whole cost is £191. 17*s.* 0$\frac{3}{4}$*d.*, find the lengths of the sides of the field.

[SPECIMEN PAGE]

8. Calculate approximately the area and circumference of a circle inscribed in a square whose side is 359·5678 feet.

9. Find the volume of a prism on a triangular base the sides of which are 47·3, 38·9, 2·7 inches respectively, the height being 55·8 inches.

10. If V is the volume of a sphere and A the area of its surface, prove that

$$3 \log A = 2 \log 6 + \log \pi + 2 \log V.$$

Calculate the value of A, if $V = 796{\cdot}325$ cubic inches.

EXERCISE XXXIII.

1. Evaluate (1) $52{\cdot}4574 \times 3{\cdot}78472$;
(2) $(5{\cdot}7432)^{1{\cdot}246}$.

2. Find to six places of decimals the value of

$$\frac{87{\cdot}327 \times 784{\cdot}55 \times {\cdot}020868}{{\cdot}61659 \times 58{\cdot}844}.$$

3. How many terms of the series

·04, ·08, ·16, ·32, ·64, ...

will amount to 41943?

4. A person borrowed £11000 for two months at 5 per cent. per annum. At the end of the time he was unable to pay the interest; it was, therefore, added to the principal and the debt was allowed to run for another two months. This was continually repeated, till at the end of 2 years the debt and interest were paid; how much did this amount to?

5. Looking due South from the top of a cliff which is 37·7 yards high, an observer sees two objects whose angles of depression are 27° 18′ 35″ and 43° 12′ 14″ respectively; find the distance between them.

6. A ship sailing due East is observed at 10 o'clock to be in a direction 15° 37′ East of South; at 12.15 the ship is observed to be 57° 12′ East of South; if the ship sails 10 miles an hour, find the distance of the observer from each position of the ship.

7. Compute to the nearest square inch the area of a circle in which a chord 4 ft. in length subtends at the centre an angle 28° 36′.

8. The diagonal of a cube is 58·9342 inches; find the radius of a sphere whose surface is equal to that of the cube.

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ALGEBRA
FOR BEGINNERS

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EXTRACT FROM PREFACE

The present work has been undertaken in order to supply a demand for an easy introduction to our *Elementary Algebra for Schools*, and also to meet the wishes of those who, while approving of the order and treatment of the subject there laid down, have felt the want of a beginners' text-book in a cheaper form.

It will be found that full provision has been made in the following pages for all the public examinations which do not require a knowledge of Algebra beyond Quadratic Equations. The Explanations are given in somewhat simpler language than in the *Elementary Algebra*, while the examples for practice are entirely new; thus the two books are supplementary to each other, and in many classes may be conveniently used together.

PRESS OPINIONS

Aberdeen Free Press—"To give the learner a sufficient knowledge of the ordinary algebraical processes without presenting him with too many of their difficulties requires a thorough knowledge of what is necessary for a beginner, and of what may be omitted until a more advanced stage. A very slight examination of the book shows that the authors possess this qualification in an eminent degree. . . . The definitions and explanations of symbols are full and simple. . . . **An important feature of the work is the great number of problems given to show the practical applications of the science.**"

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Glasgow Herald—"**Seems in all respects to deserve an equally favourable reception to that of its predecessor.**"

Guardian—"It possesses the systematic arrangement and the lucidity which have gained so much praise for the works previously written by the same authors in collaboration."

[SPECIMEN PAGE]

Example 3. *A* and *B* are playing for money; *A* begins with £p and *B* with q shillings. *B* wins £x; express by an equation the fact that *A* has now 3 times as much as *B*.

What *B* has won *A* has lost;

$\therefore$ *A* has $p-x$ pounds, that is $20(p-x)$ shillings,

B has q shillings $+x$ pounds, that is $q+20x$ shillings.

Thus the required equation is $20(p-x) = 3(q+20x)$.

Example 4. A man travels a miles by coach and b miles by train; if the coach goes at the rate of 7 miles an hour, and the train at the rate of 25 miles per hour, how long does the journey take?

The coach travels 7 miles in 1 hour;

$\therefore$ ..... 1 ..... $\frac{1}{7}$ hour;

that is, ... a ..... $\frac{a}{7}$ hours.

Similarly the train travels b miles in $\frac{b}{25}$ hours.

$\therefore$ the whole time occupied is $\frac{a}{7}+\frac{b}{25}$ hours.

Example 5. How many men will be required to do in p hours what q men do in np hours?

np hours is the time occupied by q men;

$\therefore$ 1 hour ..... $q \times np$ men;

that is, p hours..... $\frac{q \times np}{p}$ men.

Therefore the required number of men is qn.

EXAMPLES X. b.

1. Write down three consecutive numbers of which a is the least.
2. Write down four consecutive numbers of which b is the greatest.
3. Write down five consecutive numbers of which c is the middle one.
4. What is the next odd number after $2n-1$?
5. What is the even number next before $2n$?
6. Write down the product of three odd numbers of which the middle one is $2x+1$.
7. How old is a man who will be x years old in 15 years?
8. How old was a man x years ago if his present age is n years?
9. In $2x$ years a man will be y years old, what is his present age?

[SPECIMEN PAGE]

139. By suitably grouping together the terms, compound expressions can often be expressed as the difference of two squares, and so be resolved into factors.

Example 1. Resolve into factors $9a^2 - c^2 + 4cx - 4x^2$.

$$\begin{aligned} 9a^2 - c^2 + 4cx - 4x^2 &= 9a^2 - (c^2 - 4cx + 4x^2) \\ &= (3a)^2 - (c - 2x)^2 \\ &= (3a + c - 2x)(3a - c + 2x). \end{aligned}$$

Example 2. Resolve into factors $2bd - a^2 - c^2 + b^2 + d^2 + 2ac$.

Here the terms $2bd$ and $2ac$ suggest the proper preliminary arrangement of the expression. Thus

$$\begin{aligned} 2bd - a^2 - c^2 + b^2 + d^2 + 2ac &= b^2 + 2bd + d^2 - a^2 + 2ac - c^2 \\ &= b^2 + 2bd + d^2 - (a^2 - 2ac + c^2) \\ &= (b + d)^2 - (a - c)^2 \\ &= (b + d + a - c)(b + d - a + c) \end{aligned}$$

140. The following case is important.

Example. Resolve into factors $x^4 + x^2y^2 + y^4$.

$$\begin{aligned} x^4 + x^2y^2 + y^4 &= (x^4 + 2x^2y^2 + y^4) - x^2y^2 \\ &= (x^2 + y^2)^2 - (xy)^2 \\ &= (x^2 + y^2 + xy)(x^2 + y^2 - xy) \\ &= (x^2 + xy + y^2)(x^2 - xy + y^2). \end{aligned}$$

141. Sometimes an expression may be resolved into more than two factors.

Example 1. Resolve into factors $16a^4 - 81b^4$.

$$\begin{aligned} 16a^4 - 81b^4 &= (4a^2 + 9b^2)(4a^2 - 9b^2) \\ &= (4a^2 + 9b^2)(2a + 3b)(2a - 3b). \end{aligned}$$

Example 2. Resolve into factors $x^6 - y^6$.

$$\begin{aligned} x^6 - y^6 &= (x^3 + y^3)(x^3 - y^3) \\ &= (x + y)(x^2 - xy + y^2)(x - y)(x^2 + xy + y^2). \end{aligned}$$

Note. When an expression can be arranged either as the difference of two squares, or as the difference of two cubes, each of the methods explained in Arts. 136, 137 will be applicable. It will, however, be found simplest to first use the rule for resolving into factors the difference of two squares.

[SPECIMEN PAGE]

Converse Use of Factors.

143. The actual processes of multiplication and division can often be partially or wholly avoided by a skilful use of factors.

It should be observed that the formulæ which the student has seen exemplified in this chapter are just as useful in their converse as in their direct application. Thus the formula for resolving into factors the difference of two squares is equally useful as enabling us to write down at once the product of the sum and the difference of two quantities.

Example 1. Multiply $2a+3b-c$ by $2a-3b+c$.

These expressions may be arranged thus:

$$2a+(3b-c) \text{ and } 2a-(3b-c).$$

Hence the product $= \{2a+(3b-c)\}\{2a-(3b-c)\}$

$$= (2a)^2-(3b-c)^2$$
$$= 4a^2-(9b^2-6bc+c^2)$$
$$= 4a^2-9b^2+6bc-c^2.$$

Example 2. Find the product of

$$x+2,\ x-2,\ x^2-2x+4,\ x^2+2x+4.$$

Taking the first factor with the third, and the second with the fourth,

the product $= \{(x+2)(x^2-2x+4)\}\{(x-2)(x^2+2x+4)\}$

$$= (x^3+8)(x^3-8)$$
$$= x^6-64.$$

Example 3. Divide the product of $2x^2+x-6$ and $6x^2-5x+1$ by $3x^2+5x-2$.

Denoting the division by means of a fraction,

the required quotient $= \dfrac{(2x^2+x-6)(6x^2-5x+1)}{3x^2+5x-2}$

$$= \frac{(2x-3)(x+2)(3x-1)(2x-1)}{(3x-1)(x+2)}$$
$$= (2x-3)(2x-1),$$

by cancelling factors which are common to numerator and denominator.

[SPECIMEN PAGE]

Reduce to lowest terms :

4. $\dfrac{5x^2yz^2}{5x^2y+10x^2z}$. 5. $\dfrac{9x^2-y^2}{6x^2y-2xy^2}$. 6. $\dfrac{2x^2y^2-8}{3x^2y+6x}$.

7. $\dfrac{x^2+4x}{x^2+x-12}$. 8. $\dfrac{7a^2x-7a^2c}{5cx^2-10c^2x+5c^3}$. 9. $\dfrac{x^2+x-30}{5x^2+30x}$.

10. $\dfrac{(2a+b)^2}{4a^2-ab^2}$. 11. $\dfrac{a^3+b^3}{a^2-ab-2b^2}$. 12. $\dfrac{2c^2+5cd-3d^2}{c^2+6cd+9d^2}$.

13. $\dfrac{x^2-4x-21}{3x^2+10x+3}$. 14. $\dfrac{x^2-2x-15}{3x^2-12x-15}$. 15. $\dfrac{2x^2+x-3}{2x^2+11x+12}$.

16. $\dfrac{3a^3-24}{4a^2+4a-24}$. 17. $\dfrac{4x^3-25xy^2}{2x^2+xy-15y^2}$. 18. $\dfrac{18a^3+6a^2x+2ax^2}{27a^3-x^3}$.

155. When the factors of the numerator and denominator cannot be determined by inspection, the fraction may be reduced to its lowest terms by dividing both numerator and denominator by the highest common factor, which may be found by the rules given in Chap. XVIII.

Example. Reduce to lowest terms $\dfrac{3x^3-13x^2+23x-21}{15x^3-38x^2-2x+21}$.

The H.C.F. of numerator and denominator is $3x-7$.

Dividing numerator and denominator by $3x-7$, we obtain as respective quotients x^2-2x+3 and $5x^2-x-3$.

Thus $\dfrac{3x^3-13x^2+23x-21}{15x^3-38x^2-2x+21}=\dfrac{(3x-7)(x^2-2x+3)}{(3x-7)(5x^2-x-3)}=\dfrac{x^2-2x+3}{5x^2-x-3}$.

156. If either numerator or denominator can readily be resolved into factors we may use the following method.

Example. Reduce to lowest terms $\dfrac{x^3+3x^2-4x}{7x^3-18x^2+6x+5}$.

The numerator $=x(x^2+3x-4)=x(x+4)(x-1)$.

Of these factors the only one which can be a common divisor is $x-1$. Hence, arranging the denominator so as to shew $x-1$ as a factor,

the fraction $=\dfrac{x(x+4)(x-1)}{7x^2(x-1)-11x(x-1)-5(x-1)}$

$=\dfrac{x(x+4)(x-1)}{(x-1)(7x^2-11x-5)}=\dfrac{x(x+4)}{7x^2-11x-5}$

10. Solve the equations:

(1) $x-6-\frac{x-12}{3}=\frac{x-4}{2}+\frac{x-8}{4}$;

(2) $x+y-z=0, \quad x-y+z=4, \quad 5x+y+z=20$;

(3) $\frac{ax+b}{c}+\frac{dx+e}{f}=1.$

11. Simplify $\frac{x+3}{x^2-5x+6}-\frac{x+2}{x^2-9x+14}+\frac{4}{x^2-10x+21}.$

12. A purse of sovereigns is divided amongst three persons, the first receiving half of them and one more, the second half of the remainder and one more, and the third six. Find the number of sovereigns the purse contained.

---

13. If $h=-1$, $k=2$, $l=0$, $m=1$, $n=-3$, find the value of

$$\frac{h^3(m-l)-\sqrt{3hn}+hk}{m(l-h)-2hm^2+\sqrt[3]{4hk}}.$$

14. Find the L.C.M. of

$15(p^3+q^3)$, $5(p^2-pq+q^2)$, $4(p^3+pq+q^2)$, $6(p^2-q^2)$.

15. Find the square root of

(1) $\frac{4x^2}{9}+\frac{9}{4x^2}-2$;

(2) $1-6a+5a^2+12a^3+4a^4.$

16. Simplify $\frac{20x^2+27x+9}{15x^2+19x+6}+\frac{20x^2+27x+9}{12x^2+17x+6}.$

17. Solve the equations:

(1) $\frac{a(x-b)}{a-b}+\frac{b(x-a)}{b-a}=1$;

(2) $\frac{9}{x-4}+\frac{3}{x-8}=\frac{4}{x-9}+\frac{8}{x-3}.$

18. A sum of money is to be divided among a number of persons; if 8s. is given to each there will be 3s. short, and if 7s. 6d. is given to each there will be 2s. over: find the number of persons.

[SPECIMEN PAGE]

195. In the result $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$,

it must be remembered that the expression $\sqrt{(b^2 - 4ac)}$ is the square root of the compound quantity $b^2 - 4ac$, *taken as a whole.* We cannot simplify the solution unless we know the numerical values of a, b, c. It may sometimes happen that these values do not make $b^2 - 4ac$ a perfect square. In such a case the exact numerical solution of the equation cannot be determined.

Example. Solve $5x^2 - 13x - 11 = 0$.

Here $a = 5$, $b = -13$, $c = -11$; therefore by the formula we have

$$x = -\frac{(-13) \pm \sqrt{(-13)^2 - 4 \,.\, 5(-11)}}{2 \,.\, 5}$$

$$= \frac{13 \pm \sqrt{169 + 220}}{10}$$

$$= \frac{13 \pm \sqrt{389}}{10}.$$

Since 389 has not an exact square root this result cannot be simplified; thus the two roots are

$$\frac{13 + \sqrt{389}}{10}, \quad \frac{13 - \sqrt{389}}{10}.$$

196. Solution by Factors. There is still one method of obtaining the solution of a quadratic which will sometimes be found shorter than either of the methods already given.

Consider the equation $x^2 + \frac{7}{3}x = 2$.

Clearing of fractions, $3x^2 + 7x - 6 = 0$.....(1);

by resolving the left-hand side into factors we have

$$(3x - 2)(x + 3) = 0.$$

Now if *either* of the factors $3x - 2$, $x + 3$ be zero, their product is zero. Hence the quadratic equation is satisfied by either of the suppositions

$$3x - 2 = 0, \text{ or } x + 3 = 0.$$

Thus the roots are $\frac{2}{3}$, -3.

It appears from this that *when a quadratic equation has been simplified and brought to the form of equation* (1), its solution can always be readily obtained if the expression on the left-hand

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Elementary Algebra for Schools

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(3) A fuller treatment of the *Remainder Theorem* and its applications will be found on pages 236, 237.

(4) Five new sets of *Miscellaneous Examples* have been added at convenient intervals, beginning with one on page 32, which replaces Examples IV. c. With the exception of this change and a combination of Examples XI. b and XI. c, which now appear as one exercise, all the original examples will be found under their old numbers and with the answers unaltered, even where the examples themselves have been improved.

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Atherstone, Grammar School; Aspatria, Agricultural College; Ayr, The Academy; Arbroath, High School; Ashby-de-la-Zouch, Grammar School; Banbury, All Saints' School, Bloxham; Bangor, Friars' School; Barnard Castle, N. E. County School; Barnet, Friern Barnet High School; Basingstoke, Queen's School; Batley, Grammar School; Bath, Competitive College; Bath, Kingswood School; Bath, Combe Down School; Bath, King Edward's School; Bath, St. Gregory's College; Bath, Fortescue College; Belfast, The Academy; Belfast, St. Malachy's College; Belfast, Christian Brothers' School; Belfast, Methodist College; Belfast, Clanrye School; Berkhampstead, Grammar School; Bingley, Grammar School; Birkenhead, The College; Birkenhead, The School; Brackley, Magdalen College School; Bolton, Grammar School; Brentwood, Grammar School; Bradford, Grammar School; Bradford, Board School, Chapel Street; Bradford, Girls' Grammar School; Bridgnorth, Grammar School; Bristol, Merchant Venturers' School; Broughty Ferry, Collegiate School; Burnley, Grammar School; Burton, Grammar School; Bury, Grammar School; Canterbury, Kent College; Canterbury, King's School; Campbeltown, The Academy; Cardiff, Higher Grammar School; Carmarthen, Presbyterian College; Cavan, St. Patrick's College; Cheam, The School; Caistor, Grammar School; Carlisle, Grammar School; Carlow, The College; Castleknock, St. Vincent's College; Chelmsford, Grammar School; Cheltenham, Modern School; Cheltenham, Grammar School; Chester, King's School; Chester, Modern School; Chester, Higher Grade Board School; Chesterfield, Mount St. Mary's College; Clitheroe, Grammar School; Coatbridge, Technical School; Coatbridge, Technical Academy; Cork, Grammar School; Cork, Presentation Brothers' College; Cork, Christian Brothers' School; Crieff, Morrison's Academy; Croydon, Whitgift Grammar School; Cirencester, Royal Agricultural College; Coleraine, Academical Institution; Cookstown, Academy; Coventry, Grammar School; Crewe, The Academy; Crediton, Grammar School; Darlington, Grammar School; Dartford, Grammar School; Daventry, Grammar School; Denbigh, Grammar School; Denstone, St. Chad's College; Devonport, H.M.S. *Lion*; Devonport, Stoke Public School; Dewsbury, Wheelwright Grammar School; Dollar, The Institution; Dorchester, County School; Doncaster, Grammar School; Dublin, Blackrock College; Dublin, Belvedere College; Dublin, Christian Brothers' School; Dublin, Rathmines' School; Dublin, Alexandra College; Dublin, Alexandra School; Dublin, King's Hospital; Dudley, Grammar School; Dundalk, St. Mary's College; Dundalk, Educational Institute Dundee, Harris Academy; Dunfermline, High School; Eastbourne, The College; Eastbourne, Southdown College; Eastbourne, New College; Eccles, Modern School; Edinburgh, George Watson's College; Edinburgh, Heriot Watt College; Edinburgh, Cargilfield School; Edinburgh, College of Science; Edinburgh, Merchiston Castle School; Edinburgh, Institution; Edinburgh, Ladies' College, 70 Queen Street; Ellesmere, The College; Elgin, The Academy; Ely, King's School; Epsom, The College; Exeter, Grammar School; Exeter, Hele's School; Exeter, Heavitree College School; Falkirk, High School; Faversham, Grammar Schools Fermoy College; Fochabers, Milne's Institution; Fort Augustus, St. Benedict's; College; Framlingham, The College; Gateshead, Gateshead School; Gildersome, The College; Glasgow, Hutchesons' Grammar School; Glasgow, Queen Margaret College; Glasgow, Garnethill Public School; Glasgow, Hillhead Public School; Glasgow, The Academy; Glenalmond, Trinity College; Gloucester, Crypt Grammar School; Godalming, Hillside School; Godalming, Branksome; Gosport, Collegiate School; Gosport, Royal Academy; Goudhurst, Bethany House School; Grahamstown, St. Andrew's College; Grantham, Grammar School; Gravesend, Proprietary School; Greenwich, Royal Naval College; Greenock, Kilblain Academy;

Greenock, Holmscroft Public School; Grimsby, St. James's College; Hampton, Grammar School; Harrogate, St. George's College; Harrogate, Trinity College; Hamilton, The Academy; Hastings, University School; Headingley, Wesleyan College; Helensburgh, Larchfield Academy; Hereford, Cathedral School; Heversham, Grammar School; High Wycombe, Grammar School; Hinckley, Grammar School; Holbeach, Grammar School; Horsham, Grammar School; Houghton-le-Spring, Grammar School; Huddersfield, Technical School; Hull, Hymer's College; Hull, Leyland's School, Hornsea; Hull, Grammar School; Hurstpierpoint, St. John's College; Ilminster, Grammar School; Inverness, The College; Ipswich, Middle School for Boys; Isle of Man, King William's College; Isle of Man, Grammar School, Castletown; Jersey, St. James's College School; Kendal, Grammar School; Kidderminster, Grammar School; Killarney, St. Brendan's Seminary; King's Lynn, Grammar School; Kingston, Elmhurst School; Kingston, Tiffins' Boys' School; Kirkcaldy, Burgh School; Kirkcudbright, The Academy; Kirton, Grammar School; Lanark, Grammar School; Langholm, Academy; Launceston, Dunheved College; Leatherhead, St. John's Foundation School; Leeds, Wortley Grammar School; Leeds, Boys' Modern School; Leeds, Central Higher Grade School; Leicester, Wyggeston Boys' School; Leicester, Stoneygate School; Lichfield, Grammar School; Lincoln, Grammar School; Lincoln, Northgate School; Liscard, High School; Listowel, St. Michael's College; Liverpool, Liverpool Institute; Liverpool, St. Francis Xavier's College; Liverpool, Waterloo High School; Liverpool, Venice Street Board School; Liverpool, St. Edmund's College, Everton; Liverpool, Grove Street College for Girls; Llandilo, County School; Londonderry, Magee College; Londonderry, Academical Institution; Londonderry, Foyle College; Lucton, Grammar School; Lurgan, The College; London, City of London College, E.C.; London, Mercer's School, College Hill, E.C.; London, City Central Foundation School, E.C.; London, Birbeck Institution, E.C.; London, London Institution, E.C.; London, St. Thomas Charterhouse School of Science and Art, E.C.; London, Christ's College, Finchley; London, Owens School, Islington; London, The School, Mill Hill; London, North London Collegiate School, Camden Town; London, Belsize School, Hampstead; London, Maria Grey College, Brondesbury; London, Eltham College, Eltham; London, School for Sons of Missionaries, Blackheath; London, St. Olave's Grammar School, Southwark; London, Connaught Military College, Blackheath; London, St. Dunstan's College, Catford; London, Aske's School, Hatcham; London, Wilson's Grammar School, Camberwell; London, Roan Girl's School, Greenwich; London, Alleyne's School, Dulwich; London, Blackheath Proprietary School; London, Manor House, Old Road, Lee; London, United Westminster School, Victoria Street, S.W.; London, Tooting College, S.W.; London, Boy's High School, Clapham; London, Onslow College, Chelsea; London, Godolphin School, Hammersmith; London, Grammar School, Kensington Square, W.; Louth, Grammar School; Macclesfield, Grammar School; Manchester, St. Bede's College; Manchester, High School, Fallowfield; Manchester, Central Higher Grammar School; Manchester, Hulme Trust School; Manchester, Mechanics' Institute, Princess Street; Manchester, School of Science and Art, Central Board School; Margate, Thanet Collegiate School; Margate, New College; Marlborough, Grammar School; Maynooth, St. Patrick's College; Middlesboro, High School; Monmouth, Grammar School; Montrose, The Academy; Montrose, Techincal College; Moulton, Grammar School; Musselburgh, Loretto School; Navan, St. Finian's Seminary; Navan, Loretto Convent School; Newcastle-on-Tyne, Grammar School; Newcastle-on-Tyne, Allan's Endowed School;

Newcastle-on-Tyne, Pupil Teachers' Centre (Prudhoe Street); Newcastle-on-Tyne, Mechanics' Institute (Elswick); Newcastle (Staffordshire), High School; Newry, St. Colman's College (Violet Hill); Newton Abbot, Newton College; Northampton, Waterloo College; Norwich, King Edward VI.'s Middle School; Norwich, Grammar School; Nottingham, Baptist College; Nottingham, People's College; Oundle, Laxton Grammar School; Ormskirk, Grammar School; Oxford, High School; Oxford, St. Kenelm's College; Oxford, St. Edward's School-Summertown; Paignton, Grammar School; Paisley, Grammar School; Paisley, Neilston Institution; North Pangbourn, Woodcote House; Pembroke Dock, County Intermediate School; Penrith, Blencowe Grammar School; Perth, The Academy; Perth, Sharp's Institution; Peterborough, King's School; Plymouth, Corporation Grammar School; Plymouth, Western College; Plymouth, Mannamead School; Preston, Grammar School; Probus, Grammar School; Portsmouth, Buckingham Place Academy; Portsmouth, Grammar School; Purley, Warehouseman's School; Rathfarnham, St. Columba's College; Ramsgate, St. Augustine's College; Ramsgate, Ramsgate College; Ramsgate, Ramsgate School; Reigate, Grammar School; Reigate, St. David's College; Ripon, Grammar School; Rochester, Mathematical School; Rochester, King's School; Richmond (Yorks.), Grammar School; Rotherham, Grammar School; Ruabon, Grammar School, Rugby, Lower School; St. Andrews, St. Leonard's School; St. Bees, Grammar School; St. Kitt's B.W.I. Grammar School; St. Leonard's, Maze Hill School; St. Leonard's, Winchester House School; St. Peters, Stonehouse School; Salford; Pupil Teachers' Central Classes; Sallins, Clongowes Wood College; Saltburn, Collegiate School; Sandwich, Grammar School; Sheffield, Firth College; Sheffield, Central Higher Grade School; Sheffield, Grammar School; Sheffield, Technical School; Sheffield, Wesley College; Slough, British Orphan Asylum; Slough, Stoke House School; Shildon, Friend's British School; Silcoates, Northern Congregational School; Southampton, Boys' College; Southampton, Hartley Institution; Southport, University School; Southport, Sandringham School; Sligo, The College; Southsea, Hope House School; Southwick, Merton House School; Spalding, Grammar School; Stafford, Grammar School; Stirling, High School; Stony Stratford, St. Paul's College; Stourbridge, Grammar School; Stratford-on-Avon, Trinity College School; Stroud, Marling Endowed School; Sutton Coldfield, Grammar School; Sutton Valence, Grammar School; Swansea, St. Andrew's College; Swindon, High School; Taunton, The Huish School; Tenbury, St. Michael's College; Tettenhall College; Thurles, St. Patrick's College; Tipperary, Christian School; Torquay, Torbay College; Tottenham, Tottenham College; Towcester, Grammar School; Tralee, Intermediate and University School; Twickenham, King's College; Uddingston, Uddingston Academy; Uttoxeter, Grammar School; Walsall, Queen Mary's School; Warrington, Grammar School; Warwick, King's School; Waterford, Christian Brothers' College; Waterford, Ursuline Convent School; Watford London Orphan Asylum; Wellingboro, Grammar School; Weybridge, St. George's College; Weymouth, Weymouth, College; Whalley (Lancs.), Stoneyhurst College; Whalley, Royal Grammar School; Wigan, Grammar School; Windsor, St. Stanislaus' College; Windsor, St. Mark's School; Woodbridge, Grammar School; Woodford, Bancroft School; Wood Green, Royal Masonic School; Worcester, Queen Elizabeth's School; Worcester, Cathedral School; Wymondham, Grammar School; Yarmouth, Grammar School; York, St. Peter's School; York, Archbishop Holgate's School.

The Method of Detached Coefficients.

45. When two compound expressions contain powers of one letter only, the labour of multiplication may be lessened by using **detached coefficients**, that is, by writing down the coefficients only, multiplying them together in the ordinary way, and then inserting the successive powers of the letter at the end of the operation. In using this method the expressions must be arranged according to ascending or descending powers of the common letter, and zero coefficients must be used to represent terms corresponding to missing powers of that letter.

Example. Multiply $2x^3-4x^2-5$ by $3x^2+4x-2$.

$$\begin{array}{r} 2-\ 4+\ 0-\ 5 \\ 3+\ 4-\ 2 \\ \hline 6-12+\ 0-15 \\ \quad 8-16+\ 0-20 \\ \quad\quad -\ 4+\ 8-\ 0+10 \\ \hline 6-\ 4-20-\ 7-20+10 \end{array}$$

Here we insert a zero coefficient to represent the power of x which is absent in the multiplicand. In the product the highest power of x is clearly x^5, and the others follow in descending order.

Thus the product is

$$6x^5-4x^4-20x^3-7x^2-20x+10.$$

The method of detached coefficients may also be used to multiply two compound expressions which are homogeneous and contain powers of two letters.

Example. Multiply $3a^4+2a^3b+4ab^3+2b^4$ by $2a^2-b^2$.

$$\begin{array}{r} 3+2+0+4+2 \\ 2+0\ -1 \\ \hline 6+4+0+8+4 \\ \quad -3-2-0-4-2 \\ \hline 6+4-3+6+4-4-2 \end{array}$$

We write a zero coefficient to represent the term containing a^2b^2 which is absent in the first expression. Similarly, the term containing ab is represented by a zero coefficient in the second expression.

The law of formation of the literal factors is easily seen, and the complete product is

$$6a^6+4a^5b-3a^4b^2+6a^3b^3+4a^2b^4-4ab^5-2b^6.$$

Note. Beginners should on no account attempt to use detached coefficients until they are well practised in the ordinary full process of multiplication.

[SPECIMEN PAGE]

Example. Resolve into factors $7x^2 - 19x - 6$.

Write down $(7x \quad 3)(x \quad 2)$ for a first trial, noticing that 3 and 2 must have opposite signs. These factors give $7x^2$ and -6 for the first and third terms. But since $7 \times 2 - 3 \times 1 = 11$, the combination fails to give the correct coefficient of the middle term.

Next try $(7x \quad 2)(x \quad 3)$.

Since $7 \times 3 - 2 \times 1 = 19$, these factors will be correct if we insert the signs so that the negative shall predominate.

Thus $7x^2 - 19x - 6 = (7x + 2)(x - 3)$.

[Verify by mental multiplication.]

132. In actual work it will not be necessary to put down all these steps at length. The student will soon find that the different cases may be rapidly reviewed, and the unsuitable combinations rejected at once.

It is especially important to pay attention to the two following hints:

1. If the third term of the trinomial is positive, then the second terms of its factors have both the same sign, and this sign is the same as that of the middle term of the trinomial.

2. If the third term of the trinomial is negative, then the second terms of its factors have opposite signs.

Example 1. Resolve into factors $14x^2 + 29x - 15$ .....(1),
$14x^2 - 29x - 15$ .....(2).

In each case we may write down $(7x \quad 3)(2x \quad 5)$ as a first trial, noticing that 3 and 5 must have opposite signs.

And since $7 \times 5 - 3 \times 2 = 29$, we have only now to insert the proper signs in each factor.

In (1) the positive sign must predominate,

in 2 the negative .....

Therefore $14x^2 + 29x - 15 = (7x - 3)(2x + 5)$.
$14x^2 - 29x - 15 = (7x + 3)(2x - 5)$.

Example 2. Resolve into factors $5x^2 + 17x + 6$ .....(1),
$5x^2 - 17x + 6$ .....(2).

In (1) we notice that the factors which give 6 are both positive.
In (2) ..... negative.

And therefore for (1) we may write $(5x + \quad)(x + \quad)$.
(2) ..... $(5x - \quad)(x - \quad)$.

And, since $5 \times 3 + 1 \times 2 = 17$, we see that

$5x^2 + 17x + 6 = (5x + 2)(x + 3)$.
$5x^2 - 17x + 6 = (5x - 2)(x - 3)$.

Resuming the work, we have

$$\begin{array}{r|l|l|l}
x & 3x^3-13x^2+23x-21 & 3x^2-10x+7 & x \\
 & 3x^3-10x^2+7x & 3x^2-7x & \\
\hline
-1 & \quad -3x^2+16x-21 & \quad -3x+7 & -1 \\
 & \quad -3x^2+10x-7 & \quad -3x+7 & \\
\hline
 & \qquad 2)\,6x-14 & & \\
\hline
 & \qquad 3x-7 & &
\end{array}$$

Therefore the H.C.F. is $3x-7$.

The factor 2 has been removed on the same grounds as the factor 9 above.

Example 2. Find the highest common factor of

$$2x^3+x^2-x-2 \quad \ldots\ldots(1),$$

and

$$3x^3-2x^2+x-2 \quad \ldots\ldots(2),$$

As the expressions stand we cannot begin to divide one by the other without using a fractional quotient. The difficulty may be obviated by *introducing* a suitable factor, just as in the last case we found it useful to remove a factor when we could no longer proceed with the division in the ordinary way. The given expressions have no common *simple* factor, hence their H.C.F. cannot be affected if we multiply either of them by any simple factor.

Multiply (2) by 2, and use (1) as a divisor:

$$\begin{array}{r|l|l|l}
 & 2x^3+x^2-x-2 & 6x^3-4x^2+2x-4 & 3 \\
 & 7 & 6x^3+3x^2-3x-6 & \\
\hline
-2x & 14x^3+7x^2-7x-14 & \quad -7x^2+5x+2 & \\
 & 14x^3-10x^2-4x & \quad 17 & \\
\hline
17x & \qquad 17x^2-3x-14 & -119x^2+85x+34 & -7 \\
 & \qquad 17x^2-17x & -119x^2+21x+98 & \\
\hline
14 & \qquad\qquad 14x-14 & \qquad 64)\,64x-64 & \\
 & \qquad\qquad 14x-14 & \qquad\qquad x-1 &
\end{array}$$

Therefore the H.C.F. is $x-1$.

After the first division the factor 7 is introduced because the first remainder $-7x^2+5x+2$ will not divide $2x^3+x^2-x-2$. At the next stage the factor 17 is introduced for a similar reason, and finally the factor 64 is removed as explained in Example 1.

Note. Here the highest common factor might have been more easily obtained by arranging the expressions in *ascending* powers of x. In this case it will be found that there is no need to introduce a numerical factor in the course of the work. Detached coefficients, as explained in Art. 45, may also be used with advantage here, and will often effect a considerable saving of labour.

[SPECIMEN PAGE]

152. When the factors of the numerator and denominator cannot be determined by inspection, the fraction may be reduced to its lowest terms by dividing both numerator and denominator by the highest common factor, which may be found by the rules given in Chap. XVIII.

Example. Reduce to lowest terms $\dfrac{3x^3-13x^2+23x-21}{15x^3-38x^2-2x+21}$.

First Method. The H.C.F. of numerator and denominator is $3x-7$.

Dividing numerator and denominator by $3x-7$, we obtain as respective quotients x^2-2x+3 and $5x^2-x-3$.

Thus $$\frac{3x^3-13x^2+23x-21}{15x^3-38x^2-2x+21}=\frac{(3x-7)(x^2-2x+3)}{(3x-7)(5x^2-x-3)}=\frac{x^2-2x+3}{5x^2-x-3}.$$

This is the simplest solution for the beginner; but in this and similar cases we may often effect the reduction without actually going through the process of finding the highest common factor.

Second Method. By Art. 141, the H.C.F. of numerator and denominator must be a factor of their sum $18x^3-51x^2+21x$, that is, of $3x(3x-7)(2x-1)$. If there be a common divisor it must clearly be $3x-7$; hence arranging numerator and denominator so as to shew $3x-7$ as a factor,

$$\begin{aligned}\text{the fraction} &= \frac{x^2(3x-7)-2x(3x-7)+3(3x-7)}{5x^2(3x-7)-x(3x-7)-3(3x-7)}\\ &= \frac{(3x-7)(x^2-2x+3)}{(3x-7)(5x^2-x-3)}\\ &= \frac{x^2-2x+3}{5x^2-x-3}.\end{aligned}$$

153. If either numerator or denominator can readily be resolved into factors we may use the following method.

Example. Reduce to lowest terms $\dfrac{x^3+3x^2-4x}{7x^3-18x^2+6x+5}$.

The numerator $=x(x^2+3x-4)=x(x+4)(x-1)$.

Of these factors the only one which can be a common divisor is $x-1$. Hence, arranging the denominator,

$$\begin{aligned}\text{the fraction} &= \frac{x(x+4)(x-1)}{7x^2(x-1)-11x(x-1)-5(x-1)}\\ &= \frac{x(x+4)(x-1)}{(x-1)(7x^2-11x-5)}=\frac{x(x+4)}{7x^2-11x-5}.\end{aligned}$$

MISCELLANEOUS EXAMPLES IV.

[*The following Examples for revision are arranged in groups under different headings; each group illustrates one or more of the principal rules and processes already discussed, and for the most part the Examples present more variety and difficulty than those of the same type which have appeared in previous exercises.*]

Substitutions and Brackets.

1. Find the value of $\dfrac{a+\sqrt{a^2+b^2}}{a^3-2b(a^2-b^2)}$ when $a=-4$, $b=-3$.

2. When $a=1$, $b=-1$, $c=2$ evaluate the expression

$$\sqrt{3a^3(b-c)+3b^3(c-a)+3c^3(a-b)}.$$

3. Simplify

$$a(b-c)^3-a(b-c)(2b^2-bc+2c^2)+(ab+ac)(b^2-c^2);$$

and find its value when $a=1$, $b=2$, $c=3$.

4. Find the value of

$$\sqrt[3]{\{5(b^2-c^2)-a^2\}}+\sqrt[4]{3\{a(a^2-c^2)-1\}}$$

when $a=4$, $b=5$, $c=3$.

5. Find the value of

$$\sqrt{(x^2+y^3+z)(x-y-3z)}\div\sqrt[3]{xy^3z^2}$$

when $x=-1$, $y=-3$, $z=1$.

6. When $a=0$, $b=2$, $x=1$, $y=-3$, $z=5$, find the numerical value of

(1) $(x-y)^3-3a(x-y)^2+3b(x^3-y^3)$;

(2) $(x-a)^3-b^2(x-y+z)+\sqrt{(bx^2-axy+y^2+z^2)}$.

7. If $x=6$, $y=7$, $z=8$, find the value of

(1) $x\left\{\frac{x}{7}-\frac{2}{3}\left(\frac{y}{4}+1\right)\right\}-\frac{2}{7}\left\{y(x+1)+\frac{1}{2}(x^2-2y)-\frac{7x}{3}\right\}$;

as will be given effect a col... $\frac{y}{2}\left\{y-3\left(\frac{x}{3}-xz^2\right)\right\}-2xz\left\{-y\left(1+\frac{y}{2xz^2}\right)\right\}$.

Example. Find the value of

$$\frac{a}{(a-b)(a-c)(x-a)}+\frac{b}{(b-c)(b-a)(x-b)}+\frac{c}{(c-a)(c-b)(x-c)}.$$

Changing the sign of one factor in each denominator, so as to preserve cyclic order, we get for the lowest common denominator,

$$(a-b)(b-c)(c-a)(x-a)(x-b)(x-c).$$

The whole expression has for its numerator

$$-[a(b-c)(x-b)(x-c)+\ldots\ldots+\ldots\ldots]$$

or $$-[a(b-c)\{x^2-(b+c)x+bc\}+\ldots\ldots+\ldots\ldots].$$

Arrange it according to powers of x; thus

coefficient of $x^2 = -\{a(b-c)+b(c-a)+c(a-b)\}$
$=0$;

coefficient of $x = \{a(b^2-c^2)+b(c^2-a^2)+c(a^2-b^2)\}$
$=(b-c)(c-a)(a-b)$; [Art. 223.]

terms which do not contain x
$= -\{abc(b-c)+abc(c-a)+abc(a-b)\}$
$= -abc\{b-c+c-a+a-b\}$
$=0.$

Hence the expression $=\dfrac{(b-c)(c-a)(a-b)x}{(b-c)(c-a)(a-b)(x-a)(x-b)(x-c)}$

$$=\frac{x}{(x-a)(x-b)(x-c)}.$$

Note. In examples of this kind the work will be much facilitated if the student accustoms himself to readily writing down the following equivalents:

$$(b-c)+(c-a)+(a-b)=0.$$
$$a(b-c)+b(c-a)+c(a-b)=0.$$
$$a^2(b-c)+b^2(c-a)+c^2(a-b)=-(a-b)(b-c)(c-a).$$
$$bc(b-c)+ca(c-a)+ab(a-b)=-(a-b)(b-c)(c-a).$$
$$a(b^2-c^2)+b(c^2-a^2)+c(a^2-b^2)=(a-b)(b-c)(c-a).$$

Some of the identities in XXIX. c. may also be remembered with advantage.

*EXAMPLES XXIX. d.

1. $\dfrac{a}{(a-b)(a-c)}+\dfrac{b}{(b-c)(b-a)}+\dfrac{c}{(c-a)(c-b)}.$

2. $\dfrac{bc}{(a-b)(a-c)}+\dfrac{ca}{(b-c)(b-a)}+\dfrac{ab}{(c-a)(c-b)}.$

[SPECIMEN PAGE]

Example 2. The remainder when x^4-2x^3+x-7 is divided by $x+2$ is

$$(-2)^4-2(-2)^3+(-2)-7;$$

that is, $16+16-2-7$, or 23.

Or the remainder may be found more shortly by substituting $x=-2$ in $[\{(x-2)x\}x+1]x-7$.

Example 3. Find the factors of $bc(b-c)+ca(c-a)+ab(a-b)$.

On trial, this expression vanishes when $b=c$; therefore $b-c$ is a factor. Similarly $c-a$, $a-b$ may be shewn to be factors.

$$\therefore\ bc(b-c)+ca(c-a)+ab(a-b)=M(b-c)(c-a)(a-b).....(1);$$

and since the left-hand member of this identity is only of three dimensions in a, b, c, the factor M must be some numerical quantity independent of a, b, c; its value can therefore be found by giving particular values to a, b, c, or by equating the coefficients of like terms on each side.

Let $a=0$, $b=1$, $c=2$, then (1) becomes

$$2(-1)+0+0=M(-1)\times 2\times(-1);$$

whence $M=-1$.

$$\therefore\ bc(b-c)+ca(c-a)+ab(a-b)=-(b-c)(c-a)(a-b).$$

***230.** We shall now give general proofs of the statements made in Art. 55. We suppose n to be positive and integral.

I. *To prove that* x^n-y^n *is always divisible by* $x-y$.

By the remainder theorem when x^n-y^n is divided by $x-y$ the remainder is

$$y^n-y^n, \text{ or } 0,$$

that is, x^n-y^n is always divisible by $x-y$.

II. *To prove that* x^n+y^n *is divisible by* $x+y$ *when* n *is odd, but not when* n *is even.*

By the remainder theorem when x^n+y^n is divided by $x+y$ the remainder is

$$(-y)^n+y^n.$$

(1) if n is odd, $(-y)^n+y^n=-y^n+y^n=0$;

(2) if n is even, $(-y)^n+y^n=y^n+y^n=2y^n$;

hence there is a remainder when n is even, but none when n is odd; which proves the proposition.

In like manner it may be proved that x^n-y^n is divisible by $x+y$ when n is even; and x^n+y^n is *never* divisible by $x-y$.

[SPECIMEN PAGE]

Example 1. Form the equation whose roots are 3 and -2.

The equation is $(x-3)(x+2)=0,$

or $x^2-x-6=0.$

Example 2. Form the equation whose roots are $\frac{3}{7}$ and $-\frac{4}{5}$.

The equation is $\left(x-\frac{3}{7}\right)\left(x+\frac{4}{5}\right)=0;$

that is, $(7x-3)(5x+4)=0,$

or $35x^2+13x-12=0.$

When the roots are irrational it is easier to use the following method:

Example 3. Form the equation whose roots are $2+\sqrt{3}$ and $2-\sqrt{3}$.

We have sum of roots $=4,$

product of roots $=1;$

$\therefore$ the equation is $x^2-4x+1=0,$

by using formula (2) of the present article.

341. The results of Art. 339 are most important, and they are generally sufficient to solve problems connected with the roots of quadratics. In such questions *the roots should never be considered singly*, but use should be made of the relations obtained by writing down the sum of the roots, and their product, in terms of the coefficients of the equation.

Example 1. If α and β are the roots of $x^2-px+q=0$, find the value of (1) $\alpha^2+\beta^2$, (2) $\alpha^3+\beta^3$.

We have $\alpha+\beta=p,$

$\alpha\beta=q.$

$\therefore\ \alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$

$=p^2-2q.$

Again, $\alpha^3+\beta^3=(\alpha+\beta)(\alpha^2+\beta^2-\alpha\beta)$

$=p\{(\alpha+\beta)^2-3\alpha\beta\}$

$=p(p^2-3q).$

Example 2. If α, β are the roots of the equation $lx^2+mx+n=0$, find the equation whose roots are $\frac{\alpha}{\beta}$, $\frac{\beta}{\alpha}$.

We have sum of roots $=\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta},$

product of roots $=\frac{\alpha}{\beta}\cdot\frac{\beta}{\alpha}=1;$

[SPECIMEN PAGE]

Example 1. Expand $(1+x)^{-3}$ to four terms.

$$(1+x)^{-3}=1+(-3)x+\frac{(-3)(-3-1)}{1.2}x^2+\frac{(-3)(-3-1)(-3-2)}{1.2.3}x^3+..$$

$$=1-3x+\frac{3.4}{1.2}x^2-\frac{3.4.5}{1.2.3}x^3+\ldots$$

$$=1-3x+6x^2-10x^3+\ldots.$$

Example 2. Expand $(4+3x)^{\frac{3}{2}}$ to four terms.

$$(4+3x)^{\frac{3}{2}}=4^{\frac{3}{2}}\left(1+\frac{3x}{4}\right)^{\frac{3}{2}}=8\left(1+\frac{3x}{4}\right)^{\frac{3}{2}}$$

$$=8\left[1+\frac{3}{2}\cdot\frac{3x}{4}+\frac{\frac{3}{2}\left(\frac{3}{2}-1\right)}{1.2}\left(\frac{3x}{4}\right)^2+\frac{\frac{3}{2}\left(\frac{3}{2}-1\right)\left(\frac{3}{2}-2\right)}{1.2.3}\left(\frac{3x}{4}\right)^3+\ldots\right]$$

$$=8\left[1+\frac{3}{2}\cdot\frac{3x}{4}+\frac{3}{8}\cdot\frac{9x^2}{16}-\frac{1}{16}\cdot\frac{27x^3}{64}+\ldots\right]$$

$$=8+9x+\frac{27}{16}x^2-\frac{27}{128}x^3+\ldots.$$

369. In finding the general term we must now use the formula

$$\frac{n(n-1)(n-2)\ldots\ldots(n-r+1)}{\lfloor r}x^r$$

written in full; for the symbol ${}^nC_r$ cannot be employed when n is fractional or negative.

Example 1. Find the general term in the expansion of $(1+x)^{\frac{1}{2}}$.

$$\text{The } (r+1)^{\text{th}} \text{ term}=\frac{\frac{1}{2}\left(\frac{1}{2}-1\right)\left(\frac{1}{2}-2\right)\ldots\ldots\left(\frac{1}{2}-r+1\right)}{\lfloor r}x^r$$

$$=\frac{1(-1)(-3)(-5)\ldots\ldots(-2r+3)}{2^r\lfloor r}x^r.$$

The number of factors in the numerator is r, and $r-1$ of these are negative; therefore, by taking -1 out of each of these negative factors, we may write the above expression

$$(-1)^{r-1}\frac{1.3.5\ldots\ldots(2r-3)}{2^r\lfloor r}x^r.$$

[SPECIMEN PAGE]

381. *To determine the characteristic of the logarithm of any number greater than unity.*

It is clear that a number with two digits in its integral part lies between 10^1 and 10^2; a number with three digits in its integral part lies between 10^2 and 10^3; and so on. Hence a number with n digits in its integral part lies between 10^{n-1} and 10^n.

Let N be a number whose integral part contains n digits; then

$$N = 10^{(n-1)+\text{a fraction}};$$

$$\therefore \log N = (n-1)+\text{a fraction}.$$

Hence the characteristic is $n-1$; that is, *the characteristic of the logarithm of a number greater than unity is less by one than the number of digits in its integral part, and is positive.*

382. *To determine the characteristic of the logarithm of a decimal fraction.*

A decimal with one cipher immediately after the decimal point, such as ·0324, being greater than ·01 and less than ·1, lies between 10^{-2} and 10^{-1}; a number with two ciphers after the decimal point lies between 10^{-3} and 10^{-2}; and so on. Hence a decimal fraction with n ciphers immediately after the decimal point lies between $10^{-(n+1)}$ and 10^{-n}.

Let D be a decimal beginning with n ciphers; then

$$D = 10^{-(n+1)+\text{a fraction}};$$

$$\therefore \log D = -(n+1)+\text{a fraction}.$$

Hence the characteristic is $-(n+1)$; that is, *the characteristic of the logarithm of a decimal fraction is greater by unity than the number of ciphers immediately after the decimal point and is negative.*

383. The logarithms to base 10 of all integers from 1 to 200000 have been found and tabulated; in most Tables they are given to seven places of decimals. This is the system in practical use, and it has two great advantages:

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An *independent variable* is a quantity which may have any value we choose to assign to it, and the corresponding *dependent variable* has its value determined as soon as the value of the independent variable is known.

*123. An expression of the form

$$p_0x^n + p_1x^{n-1} + p_2x^{n-2} + \ldots + p_{n-1}x + p_n$$

where n is a positive integer, and the coefficients p_0, p_1, $p_2 \ldots p_n$ do not involve x, is called a **rational and integral algebraical function of x.** In the present chapter we shall confine our attention to functions of this kind.

*124. A function is said to be **linear** when it contains no higher power of the variable than the first; thus $ax + b$ is a linear function of x. A function is said to be **quadratic** when it contains no higher power of the variable than the second; thus $ax^2 + bx + c$ is a quadratic function of x. Functions of the *third*, *fourth*,... degrees are those in which the highest power of the variable is respectively the *third*, *fourth*,.... Thus in the last article the expression is a function of x of the nth degree.

*125. The symbol $f(x, y)$ is used to denote a function of two variables x and y; thus $ax + by + c$, and $ax^2 + bxy + cy^2 + dx + ey + f$ are respectively linear and quadratic functions of x, y.

The *equations* $f(x) = 0$, $f(x, y) = 0$ are said to be linear, quadratic,... according as the *functions* $f(x)$, $f(x, y)$ are linear, quadratic,....

*126. We have proved in Art. 120 that the *expression* $ax^2 + bx + c$ admits of being put in the form $a(x - \alpha)(x - \beta)$, where α and β are the roots of the *equation* $ax^2 + bx + c = 0$.

Thus a quadratic expression $ax^2 + bx + c$ is capable of being resolved into two rational factors of the first degree, whenever the equation $ax^2 + bx + c = 0$ has rational roots; that is, when $b^2 - 4ac$ is a perfect square.

*127. *To find the condition that a quadratic function of* x, y *may be resolved into two linear factors.*

Denote the function by $f(x, y)$ where

$$f(x, y) = ax^2 + 2hxy + by^2 + 2gx + 2fy + c.$$

*305. *The series whose general term is* $\frac{1}{n\,(\log n)^p}$ *is convergent if* $p > 1$, *and divergent if* $p = 1$, *or* $p < 1$.

By the preceding article the series will be convergent or divergent for the same values of p as the series whose general term is

$$a^n \times \frac{1}{a^n\,(\log a^n)^p}, \text{ or } \frac{1}{(n \log a)^p}, \text{ or } \frac{1}{(\log a)^p} \times \frac{1}{n^p}.$$

The constant factor $\frac{1}{(\log a)^p}$ is common to every term; therefore the given series will be convergent or divergent for the same values of p as the series whose general term is $\frac{1}{n^p}$. Hence the required result follows. [Art. 290.]

*306. *The series whose general term is* u_n *is convergent or divergent according as* $Lim \left[\left\{n\left(\frac{u_n}{u_{n+1}} - 1\right) - 1\right\} \log n\right] > 1$, or < 1.

Let us compare the given series with the series whose general term is $\frac{1}{n(\log n)^p}$.

When $p > 1$ the auxiliary series is convergent, and in this case the given series is convergent by Art. 299, if

$$\frac{u_n}{u_{n+1}} > \frac{(n+1)\{\log(n+1)\}^p}{n\,(\log n)^p} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1).$$

Now when n is very large,

$$\log(n+1) = \log n + \log\left(1 + \frac{1}{n}\right) = \log n + \frac{1}{n}, \text{ nearly;}$$

Hence the condition (1) becomes

$$\frac{u_n}{u_{n+1}} > \left(1 + \frac{1}{n}\right)\left(1 + \frac{1}{n \log n}\right)^p;$$

that is,
$$\frac{u_n}{u_{n+1}} > \left(1 + \frac{1}{n}\right)\left(1 + \frac{p}{n \log n}\right);$$

that is,
$$\frac{u_n}{u_{n+1}} > 1 + \frac{1}{n} + \frac{p}{n \log n};$$

[SPECIMEN PAGE]

Example. Find the value of

$$\begin{vmatrix} 30 & 11 & 20 & 38 \\ 6 & 3 & 0 & 9 \\ 11 & -2 & 36 & 3 \\ 19 & 6 & 17 & 22 \end{vmatrix}$$

Diminish each constituent of the first column by twice the corresponding constituent in the second column, and each constituent of the fourth column by three times the corresponding constituent in the second column, and we obtain

$$\begin{vmatrix} 8 & 11 & 20 & 5 \\ 0 & 3 & 0 & 0 \\ 15 & -2 & 36 & 9 \\ 7 & 16 & 17 & 4 \end{vmatrix},$$

and since the second row has three zero constituents this determinant

$$=3\begin{vmatrix} 8 & 20 & 5 \\ 15 & 36 & 9 \\ 7 & 17 & 4 \end{vmatrix} =3\begin{vmatrix} 8 & 20 & 5 \\ 8 & 19 & 5 \\ 7 & 17 & 4 \end{vmatrix} =3\begin{vmatrix} 0 & 1 & 0 \\ 8 & 19 & 5 \\ 7 & 17 & 4 \end{vmatrix} =-3\begin{vmatrix} 8 & 5 \\ 7 & 4 \end{vmatrix} =9.$$

505. The following examples shew artifices which are occasionally useful.

Example 1. Prove that

$$\begin{vmatrix} a & b & c & d \\ b & a & d & c \\ c & d & a & b \\ d & c & b & a \end{vmatrix} = (a+b+c+d)(a-b+c-d)(a-b-c+d)(a+b-c-d).$$

By adding together all the rows we see that $a+b+c+d$ is a factor of the determinant; by adding together the first and third rows and subtracting from the result the sum of the second and fourth rows we see that $a-b+c-d$ is also a factor; similarly it can be shewn that $a-b-c+d$ and $a+b-c-d$ are factors; the remaining factor is numerical, and, from a comparison of the terms involving a^4 on each side, is easily seen to be unity; hence we have the required result.

Example 2. Prove that

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ a & b & c & d \\ a^2 & b^2 & c^2 & d^2 \\ a^3 & b^3 & c^3 & d^3 \end{vmatrix} = (a-b)(a-c)(a-d)(b-c)(b-d)(c-d).$$

The given determinant vanishes when $b=a$, for then the first and second columns are identical; hence $a-b$ is a factor of the determinant [Art. 514]. Similarly each of the expressions $a-c$, $a-d$, $b-c$, $b-d$, $c-d$ is a factor of the determinant; the determinant being of six dimensions, the remaining factor must be numerical; and, from a comparison of the terms involvi- bc^2d^3 on each side, it is easily seen to be unity; hence we obtain the reqr result.

[SPECIMEN PAGE]

Cubic Equations.

575. The general type of a cubic equation is

$$x^3 + Px^2 + Qx + R = 0,$$

but as explained in Art. 573 this equation can be reduced to the simpler form $x^3 + qx + r = 0$,
which we shall take as the standard form of a cubic equation.

576. To solve the equation $x^3 + qx + r = 0$.

Let $x = y + z$; then

$$x^3 = y^3 + z^3 + 3yz\,(y + z) = y^3 + z^3 + 3yzx,$$

and the given equation becomes

$$y^3 + z^3 + (3yz + q)\,x + r = 0.$$

At present y, z are any two quantities subject to the condition that their sum is equal to one of the roots of the given equation; if we further suppose that they satisfy the equation $3yz + q = 0$, they are completely determinate. We thus obtain

$$y^3 + z^3 = -r, \quad y^3 z^3 = -\frac{q^3}{27};$$

hence y^3, z^3 are the roots of the quadratic

$$t^2 + rt - \frac{q^3}{27} = 0.$$

Solving this equation, and putting

$$y^3 = -\frac{r}{2} + \sqrt{\frac{r^2}{4} + \frac{q^3}{27}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1),$$

$$z^3 = -\frac{r}{2} - \sqrt{\frac{r^2}{4} + \frac{q^3}{27}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2),$$

we obtain the value of x from the relation $x = y + z$; thus

$$x = \left\{-\frac{r}{2} + \sqrt{\frac{r^2}{4} + \frac{q^3}{27}}\right\}^{\frac{1}{3}} + \left\{-\frac{r}{2} - \sqrt{\frac{r^2}{4} + \frac{q^3}{27}}\right\}^{\frac{1}{3}}.$$

The above solution is generally known as *Cardan's Solution*, as it was first published by him in the *Ars Magna*, in 1545. Cardan obtained the solution from Tartaglia; but the solution of the cubic seems to have been due originally to Scipio Ferreo, about

231. It is known that at noon at a certain place the sun is hidden by clouds on an average two days out of every three: find the chance that at noon on at least four out of five specified future days the sun will be shining. [QUEEN'S COLL. OX.]

232. Solve the equations

$$\left.\begin{aligned} x^2+(y-z)^2&=a^2\\ y^2+(z-x)^2&=b^2\\ z^2+(x-y)^2&=c^2 \end{aligned}\right\}.$$

[EMM. COLL. CAMB.]

233. Eliminate x, y, z from the equations:

$$\frac{x^2-xy-xz}{a}=\frac{y^2-yz-yx}{b}=\frac{z^2-zx-zy}{c}, \text{ and } ax+by+cz=0.$$

[MATH. TRIPOS.]

234. If two roots of the equation $x^3+px^2+qx+r=0$ be equal and of opposite signs, shew that $pq=r$. [QUEENS' COLL. CAMB.]

235. Sum the series:

(1) $1+2^3x+3^3x^2+\ldots\ldots+n^3x^{n-1}$,

(2) $$\frac{25}{1^2.2^3.3^3}+\frac{52}{2^2.3^3.4^3}+\ldots\ldots+\frac{5n^2+12n+8}{n^2(n+1)^3(n+2)^3}.$$

[EMM. COLL. CAMB.]

236. If $(1+a^3x^4)(1+a^5x^8)(1+a^9x^{16})(1+a^{17}x^{32})\ldots\ldots$
$=1+A_4x^4+A_8x^8+A_{12}x^{12}+\ldots\ldots$

prove that $A_{8n+4}=a^3A_{8n}$, and $A_{8n}=a^{2n}A_{4n}$; and find the first ten terms of the expansion. [CORPUS COLL. CAMB.]

237. On a sheet of water there is no current from A to B but a current from B to C; a man rows down stream from A to C in 3 hours, and up stream from C to A in $3\frac{1}{2}$ hours; had there been the same current all the way as from B to C, his journey down stream would have occupied $2\frac{3}{4}$ hours; find the length of time his return journey would have taken under the same circumstances.

238. Prove that the nth convergent to the continued fraction

$$\frac{3}{2+}\,\frac{3}{2+}\,\frac{3}{2+}\ldots\ldots \text{ is } \frac{3^{n+1}+3(-1)^{n+1}}{3^{n+1}-(-1)^{n+1}}.$$

[EMM. COLL. CAMB.]

239. If all the coefficients in the equation

$$x^n+p_1x^{n-1}+p_2x^{n-2}+\ldots\ldots+p_n=f(x)=0,$$

be whole numbers, and if $f(0)$ and $f(1)$ be each odd integers, prove that the equation cannot have a commensurable root.

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Part I. takes in the early rules up to, and inclusive of, Simple Equations; in Part II., Involution, Evolution, and Simplé Fractions are introduced; Part III. takes in Resolution into Factors, and Fractions of all kinds; Part IV., Quadratics, Indices, and Surds; Part V., Ratio and the Progressions; Part VI., Permutations, Combinations, and the Binomial Theorem; and Part VII. consists of Papers of Miscellaneous Equations of the most useful types.

The EXAMINATION PAPERS are more varied in length and character; they will be found to comprise specimens of papers set at all the most important examinations in which a knowledge of Elementary Algebra is required.

EXERCISE XLIV.

1. Solve the equations :

(1) $\cdot 8x - \cdot 067 = \cdot 473 + \cdot 071x.$

(2) $33x + 35y = 4, \quad 55x - 55y = -16.$

2. Extract the square root of

$$16x^3(x-2) - 8x(1-3x) + 1.$$

3. Resolve into factors :

(1) $60a^4b^5 - 135a^2b^7.$ (2) $x^3 - 3x^2 + 7x - 21.$

4. Find the lowest common multiple of

$$32a^5b^2 - 32a^4b^3 + 8a^3b^4, \quad 48a^5b^5 - 48a^4b^6 + 12a^3b^7.$$

5. Find the value of

$$2 + \frac{3x}{2y} - \frac{6x}{3x+2y} + \frac{9x^2(3x-2y)}{2y(4y^2-9x^2)}.$$

6. Divide

$$2 - \frac{3n}{m} + \frac{9n^2-2m^2}{m^2+2mn} \text{ by } \frac{1}{m} - \frac{1}{m-2n-\frac{4n^2}{m+n}}$$

7. Solve the equations :

(1) $\dfrac{1}{x-2} - \dfrac{1}{x-3} + \dfrac{1}{x+1} = 0.$

(2) $a(x+y) + b(x-y) = 2a, \quad y(a+b) - x(a-b) = 2b.$

8. A dealer adds 20 per cent. to the cost price of an article to make the selling price; afterwards in selling off he deducts 10 per cent. from the selling price and then obtains a profit of 6 shillings : find the cost price.

EXERCISE XLV.

1. Divide $1 - 2x$ by $1 - x + 2x^2$ to five terms, and give the remainder.

2. Subtract the cube of $4x^2 - 3$ from the square of

$$8x^3 - 9x - 1.$$

8. Simplify $\dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{2}+\sqrt{2+\sqrt{3}}}-\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{2}-\sqrt{2-\sqrt{3}}}$.

EXERCISE XCIV.

1. Simplify

(1) $\dfrac{a^2+24bc-16b^2-9c^2}{16b^2-9c^2-6ac-a^2}\div\dfrac{a+4b-3c}{a+4b+3c}$.

(2) $\left(\dfrac{x^2}{y^2}-2+\dfrac{y^2}{x^2}\right)\left(\dfrac{x^4y^4}{xy+y^2}\right)\left(\dfrac{\dfrac{x}{y}-1+\dfrac{y}{x}}{x^3-2x^2y+xy^2}\right)$.

2. At what time between 7 and 8 o'clock will the hands of a watch be directly opposite to each other?

3. Find a value of x which will make

$$x^5-8x^3+11x^2+7x-1789$$

exactly divisible by x^2+7x-1.

4. The sum of n terms of an A. P. is 377; the first term is 11, and the common difference is 3: find n.

5. Sum to n terms the series whose r^{th} term is

$$r(r-1)(r+1).$$

6. In what scale is the denary number $18\cdot\dot{3}$ represented by $20\cdot3$?

Prove that $1\cdot2544$ is a perfect square in any scale whose radix is greater than 5.

7. Five times the number of combinations of n things 5 together is equal to eighteen times the number of combinations of $n-2$ things 3 together: find n.

8. Write down the $(k+1)^{\text{th}}$ term of $\dfrac{1}{(1-3x)^2}$, and the first two terms of the expansion of

$$\frac{(1-3x)^{\frac{2}{3}}.(1+x)^{-\frac{3}{2}}}{(1-2x)^{\frac{5}{2}}}.$$

XLII.

Queen's Scholarship Examination. December, 1898.

1. Arrange the following in ascending powers of x and collect coefficients:

$$a^3+a^2x+x^3+bx^2+c^2x+bcx-2(a+b)x^2+(ax+b^2)x.$$

2. Divide the sum of

$2p^4x-2p^3x^2+4px^4$, and $p^4x+2p^3x^2-5p^2x^3-x^5$ by p^2+px-x^2.

3. X is taken n times from Y with remainder Z. If $mZ=X$ show that Z is the G.C.M. of X and Y.

4. Simplify

$$\frac{\sqrt{(x^2+y^2)^2-(x^2-y^2)^2}}{\sqrt{(x^2-y^2)^2+4x^2y^2}}\times\frac{x^4-y^4}{\sqrt{(x^2-y^2)^2-4x^2y^2}}-2\left(\frac{x+y}{\frac{1}{x}+\frac{1}{y}}\right)^2.$$

5. Find the cube root of

$$1-6x+18x^2-32x^3+36x^4-24x^5+8x^6,$$

showing the full working.

6. Solve the equations:

(i) $(4x+3)\left(1-\frac{4}{x+3}\right)=3x-10+\frac{(x+2)(x+9)}{x+3}$;

(ii) $\frac{14}{x+1}=6-\frac{15}{x-10}$.

7. An excursion train carries first, second, and third class passengers, 760 in all. The first class fare is 7*s.* 6*d.*, second 5*s.* 6*d.*, third 4*s.* There are twice as many fir[illegible] second class passengers, and the fares amount to £186. [illegible] many second and third class passengers are there?

8. I have a quantity. If I invert it, I obtain the same amount as if I add $1\frac{11}{45}$ to it. What is the quantity?

9. (*a*) Distinguish between an identity and an equation.

(*b*) Which of the following are equations and which identities?

$$(x+a)(x^2-bx+a^2)=x^3+a^3;$$
$$(x-b)(x^2+bx+b^2)=x^3-b^3;$$
$$(x+a)(x-a)=x^2-a^2;$$
$$\tfrac{1}{2}\left\{\frac{x-a}{2}+\frac{x+a}{2}\right\}=\frac{(x+a)^2-(x-a)^2}{8a}.$$

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ALGEBRA FOR BEGINNERS

WITH NUMEROUS EXAMPLES

BY

I. TODHUNTER, Sc.D., F.R.S.

NEW EDITION THOROUGHLY REVISED

BY

S. L. LONEY, M.A.

LATE FELLOW OF SIDNEY SUSSEX COLLEGE, CAMBRIDGE; PROFESSOR AT THE ROYAL HOLLOWAY COLLEGE.

London

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Special Features of the New Edition—The size of the page has been enlarged and types of the best kinds have been used. The total quantity of matter in the book has been increased by more than one half. The total number of Examples has been more than doubled. The Examples have not all been put at the ends of the chapters, but have been arranged in sets throughout the chapters. In the Revised Edition there are 118 sets, whilst in the old Edition there are 44. The chapter on Factors has been entirely re-written, and a large number of Examples provided. The chapters on Simple Equations and Simple Equation Problems have been put earlier in the book. Additional chapters have been inserted on the Theory of Quadratic Equations, Logarithms, and Miscellaneous Propositions. The later chapters on Progressions, Permutations, and the Binomial Theorem have been considerably expanded and almost re-written. The Miscellaneous Examples have been arranged in sets for use at the different stages of the student's progress. Hardly anything has been omitted, and no chapter is without some additions and, it is hoped, improvements. Arrangements have been made to show at a glance what portions of the Revised Edition are in the old Edition.

They are 9 and 8. Thus $t^2+t-72=(t+9)(t-8)$.

$$\therefore\quad 6x^2+x-12=\frac{1}{6}[6x+9][6x-8]=(2x+3)(3x-4).$$

We now give some more examples.

Ex. 1. *Factorize* $21x^2+92x+55$.

$$21x^2+92x+55=\frac{1}{21}[21^2x^2+92\times 21x+21\times 55]\ =\frac{1}{21}[t^2+92t+1155],$$

where $t=21x$.

We want two numbers whose product is 1155 and whose sum is 92. They are 15 and 77.

$$\text{Thus } 21x^2+92x+55=\frac{1}{21}(t+15)(t+77)=\frac{1}{21}[21x+15][21x+77]$$
$$=(7x+5)(3x+11).$$

Ex. 2. *Factorize* $6x^2+x-15$.

$$6x^2+x-15=\frac{1}{6}[6^2x^2+6x-90]=\frac{1}{6}[t^2+t-90],\text{ where } t=6x.$$

We want two numbers whose product is 90 and whose difference is 1. They are 10 and 9. Thus

$$6x^2+x-15=\frac{1}{6}[t+10][t-9]=\frac{1}{6}[6x+10][6x-9]=[3x+5][2x-3].$$

Ex. 3. *Factorize* $10x^2-31x-63$.

$$\text{The expression}=\frac{1}{10}[10^2x^2-31\times 10x-630]=\frac{1}{10}[t^2-31t-630],$$

where $t=10x$.

We want two numbers whose product is 630 and whose difference is 31. They are 14 and 45. Hence the expression

$$=\frac{1}{10}[t-45][t+14]=\frac{1}{10}[10x-45][10x+14]=(2x-9)(5x+7).$$

127. Such expressions as the preceding may also be factorized by guessing. Thus consider Ex. 2 of the last article.

Two quantities whose product is $6x^2$ are $3x$ and $2x$. Also since 15 has the negative sign prefixed, the second terms of the factors must be respectively positive and negative.

Assume then as a first trial $(2x+\ )(3x-\ )$. But since the middle term of the given expression has the positive sign, this trial solution, *if it be correct*, must be $(2x+5)(3x-3)$, and this gives 6 as the coefficient of x. Our trial solution is, therefore, incorrect. Next try $(2x-\ )(3x+\ )$.

On inserting 3 and 5 respectively, we have $(2x-3)(3x+5)$, which is correct.

The student will find that in some cases it is very difficult and tedious to guess the required coefficients.

[SPECIMEN PAGE]

The student will see that we have introduced an auxiliary symbol a, to enable us to form the equation easily; and that we can remove it by division when the equation is formed.

Prob. 11. *Four gamesters, A, B, C, D, each with a different stock of money, sit down to play; A wins half of B's first stock, B wins a third part of C's, C wins a fourth part of D's, and D wins a fifth part of A's; and then each of the gamesters has £23. Find the stock of each at first.*

Let x denote the number of pounds which D won from A; then $5x$ will denote the number in A's first stock. Thus $4x$, together with what A won from B, make up 23; therefore $23-4x$ denotes the number of pounds which A won from B. And, since A won half of B's stock, $23-4x$ also denotes what was left with B after his loss to A.

Again, $23-4x$, together with what B won from C, make up 23; therefore $4x$ denotes the number of pounds which B won from C. Also, since B won a third of C's first stock, $12x$ denotes C's first stock, and therefore $8x$ denotes what was left with C after his loss to B.

Again, $8x$, together with what C won from D, make up 23; therefore $23-8x$ denotes the number of pounds which C won from D. And, since C won a fourth of D's first stock, $4(23-8x)$ denotes D's first stock; and therefore $3(23-8x)$ denotes what was left with D after his loss to C.

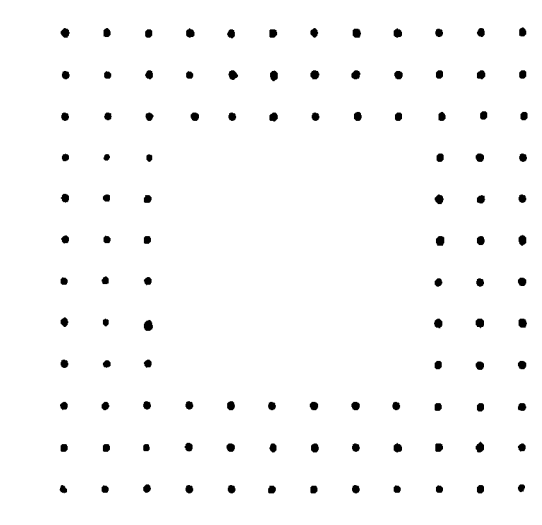
Finally, $3(23-8x)$, together with x, which D won from A, make up 23; thus

$$23 = 3(23-8x)+x, \text{ and hence } x=2.$$

Thus the stocks at first were 10, 30, 24, 28.

Prob. 12. *The number of men in a regiment is 960, and they are formed into a hollow square four deep: find the number of men in the front of this square.*

[A hollow square is a figure such as the adjoining, where the dots represent the soldiers. In this figure the number of men in the outer side is 12, and the men are standing 3 deep. The number of men in this figure is clearly equal to the difference between the number that would be in the square if it were solid, and the number that could stand in the unoccupied centre.



Now, clearly, the number of men that could stand in a side of the above unoccupied square

= number of men in outer side − twice the number of rows

$= 12 - 2 \times 3 = 12 - 6 = 6.$

Hence, in the above case, number of men $= 12^2 - 6^2 = 144 - 36 = 108.$]

[SPECIMEN PAGE]

Thus we have a remainder $-\frac{5x^4}{4}-\frac{x^5}{2}-\frac{x^6}{4}$, after finding four terms of the square root of $1-2x$; and so we know that

$$\left(1-x-\frac{x^2}{2}-\frac{x^3}{2}\right)^2=1-2x+\frac{5x^4}{4}+\frac{x^5}{2}+\frac{x^6}{4}.$$

279. Square roots by inspection. Often the square root of a quantity can be obtained by inspection alone.

We know that the square root of $a^2+2ab+b^2$ is $a+b$, that is, it is equal to the sum of the square roots of the first and last terms of the given expression.

Similarly, if x^4+6x^2+9 have a square root it is $\sqrt{(x^4)}+\sqrt{(9)}$, that is, it is x^2+3. Also since twice the product of x^2 and 3 is $6x^2$, it is clear that $(x^2+3)^2=x^4+6x^2+9$ that is, that x^2+3 is the square root.

If again the expression x^4+9x^2+16 have a square root it must be x^2+4. But since twice the product of x^2 and 4 is not equal to $9x^2$, therefore $(x^2+4)^2$ is not equal to x^4+9x^2+16, so that the latter expression has not a square root.

When therefore an expression can be arranged as a trinomial, when expressed in powers of some letter, then, if this expression has a square root, it is the sum of the roots of the first and last terms of this trinomial.

Ex. 1. *Find the square root of* $a^2+b^2+c^2+2bc+2ca+2ab$.

The expression

$$=a^2+2a(b+c)+b^2+2bc+c^2=a^2+2a(b+c)+(b+c)^2,\ldots\ldots\ldots\ldots(1)$$

and is thus a trinomial when expressed in descending powers of the letter a.

If, therefore, the expression has a square root it will

$$=\sqrt{(a^2)}+\sqrt{(b+c)^2}=a+(b+c),$$

and since the second term of (1) is twice the product of a and $(b+c)$, this quantity is the required square root.

Ex. 2. *Find the square root of* $x^6-2bx^5+b^2x^4-2bcx^2+2cx^3+c^2$.

Arrange in powers of c, and the expression

$$=c^2+2c(x^3-bx^2)+(x^6-2bx^5+b^2x^4)=c^2+2c(x^3-bx^2)+(x^3-bx^2)^2$$

and the square root is $c+(x^3-bx^2)$, that is, x^3-bx^2+c.

A quadratic equation cannot therefore have more than two roots.

335. *Discussion of the roots of a quadratic equation.*

The roots of the equation $ax^2+bx+c=0$ are

$$\frac{-b\pm\sqrt{(b^2-4ac)}}{2a}. \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

(1) If b^2 be greater than $4ac$, then b^2-4ac is positive and thus $\sqrt{(b^2-4ac)}$ is real. In this case the two values, given by (1), are both real and they are also unequal.

(2) If b^2 be equal to $4ac$, then b^2-4ac is zero and the square root in (1) vanishes. Thus, in this case, the two roots reduce to the same quantity, namely $-\frac{b}{2a}$. In this case the two roots are real and equal.

(3) If b^2 be less than $4ac$, then b^2-4ac is negative and thus $\sqrt{(b^2-4ac)}$ is an imaginary quantity. In this case, therefore, the two roots are both imaginary.

Hence **the roots of the quadratic equation**

$$\mathbf{ax^2+bx+c=0}$$

are real and unequal, equal, or imaginary according as b^2 is greater than, equal to, or less than $4ac$.

If the roots are real they are not necessarily rational. Thus $\sqrt{7}$ is a real quantity but it is not a rational quantity. In order that the roots may be real the quantity, b^2-4ac, which is under the radical sign, must be a *perfect square.*

Ex. 1. The roots of the equation $7x^2+8x+9=0$ are both imaginary, by the previous article; for $8^2-4\times7\times9=64-252=-188$ = a negative quantity.

Ex. 2. The roots of the equation $3x^2-5kx+7=0$ are equal, by the previous article, provided that $(-5k)^2-4\times3\times7$ is zero,

that is, if $\quad 25k^2=4\times3\times7=4\times21,$

that is, if $\quad 5k=\pm2\sqrt{21}$, and then $k=\pm\frac{2\sqrt{21}}{5}$.

Ex. 3. *Whatever be the value of m, prove that the roots of the equation $x^2-2x\left(m+\frac{1}{m}\right)+3=0$ are real.*

The roots are real if $\left[-2\left(m+\frac{1}{m}\right)\right]^2-4\times1\times3$ is positive,

For by subtracting one expression from the other, we have an equation of the nth degree which is satisfied by more than n values of x, and hence the coefficients of this equation must be separately zero.

520. Symmetrical Expressions. An expression is said to be symmetrical with respect to any two letters that it contains when, if these two letters are interchanged, the expression is unaltered. Thus a^2+b^2 and a^3+b^3 are symmetrical expressions with respect to a and b; but a^3+a^2b is not a symmetrical expression.

An expression is said to be symmetrical with respect to any three or more letters that it contains, when, if *any* two of the three, or more, letters be interchanged, the expression is unaltered. Thus

$$a+b+c, \quad bc+ca+ab, \quad \text{and} \quad bc(b+c)+ca(c+a)+ab(a+b)$$

are symmetrical expressions in a, b, and c. For if *any* two of these letters, say b and c, be interchanged, each of these expressions is unaltered.

As another example, the quantity $a^3+b^3+c^3+3abcd$ is symmetrical with respect to the three letters a, b, and c, but not with respect to the four letters a, b, c, and d.

521. The only expression of the first degree which is symmetrical with respect to a and b is $a+b$, or any multiple of $a+b$, such as $L(a+b)$, where L is any constant.

There are two symmetrical expressions of the second degree in a and b, namely, a^2+b^2 and ab. Also any expression obtained by adding any multiple of the first to any multiple of the second is symmetrical. Hence $L(a^2+b^2)+Mab$, where L and M are any constants whatever, is symmetrical, and the expression is called the most general symmetrical expression of the second degree in a and b.

There are two such expressions of the third degree, namely, a^3+b^3 and a^2b+ab^2, and the most general symmetrical expression is $L(a^3+b^3)+M(a^2b+ab^2)$, where L and M are constants.

So of the fourth degree there are three such expressions, namely, a^4+b^4, a^3b+ab^3, and a^2b^2, and the most general one

[SPECIMEN PAGE]

452. (428.) We may apply the Binomial Theorem to expand expressions containing more than two terms.

Ex. *Expand* $(1+2x-x^2)^4$.

Put y for $2x-x^2$; then we have

$$(1+2x-x^2)^4=(1+y)^4=1+4y+6y^2+4y^3+y^4$$
$$=1+4(2x-x^2)+6(2x-x^2)^2+4(2x-x^2)^3+(2x-x^2)^4.$$

Also

$$(2x-x^2)^2=(2x)^2-2(2x)x^2+(x^2)^2=4x^2-4x^3+x^4,$$
$$(2x-x^2)^3=(2x)^3-3(2x)^2x^2+3(2x)(x^2)^2-(x^2)^3=8x^3-12x^4+6x^5-x^6,$$
$$(2x-x^2)^4=(2x)^4-4(2x)^3x^2+6(2x)^2(x^2)^2-4(2x)(x^2)^3+(x^2)^4$$
$$=16x^4-32x^5+24x^6-8x^7+x^8.$$

Hence, collecting the terms, we obtain

$$(1+2x-x^2)^4=1+8x+20x^2+8x^3-26x^4-8x^5+20x^6-8x^7+x^8.$$

453. It will be noted that in the expansion of $(a+x)^n$ there are $(n+1)$ terms.

The second term contains x, that is x^1; the third term contains x^2, the fourth x^3, and so on, the exponent of x in each term being less by unity than the number of the term.

Thus the rth term contains x^{r-1}, the sth term x^{s-1}, and the $(r+1)^{\text{th}}$ term contains x^r.

454. General term. In the expansion of $(a+x)^n$ the term that contains x^r is called the general term, and thus, by the previous article, is the $(r+1)^{\text{th}}$ term. Its coefficient is, by Art. 447, ${}_nC_r . a^{n-r}$, that is,

$$\frac{n(n-1)(n-2)\dots(n-r+1)}{\lfloor r}a^{n-r}x^r. \quad \dots\dots(1)$$

Since, as in Art. 442,

$$\frac{n(n-1)\dots(n-r+1)}{\lfloor r}=\frac{n(n-1)\dots(n-r+1)\times\lfloor n-r}{\lfloor r\times\lfloor n-r}$$

$$=\frac{n(n-1)\dots(n-r+1)\times(n-r)(n-r-1)\dots1}{\lfloor r\,\lfloor n-r}=\frac{\lfloor n}{\lfloor r\,\lfloor n-r},$$

the quantity (1) may be written in the form

$$\frac{\lfloor n}{\lfloor r\,\lfloor n-r}a^{n-r}x^r. \quad \dots\dots(2)$$

The form (2) is sometimes more useful than (1). But (2) cannot be used, as we shall see later, for the cases when n is negative or fractional.

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ELEMENTARY ALGEBRA

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438

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With the above definition multiplication by a negative quantity presents no difficulty.

For example, to multiply 4 by -5. Since to subtract 5 by one subtraction is the same as to subtract five units successively,

$$-5 = -1-1-1-1-1;$$

$$\therefore \quad 4\times(-5) = -4-4-4-4-4$$

$$= -20.$$

Again, to multiply -5 by -4. Since

$$-4 = -1-1-1-1;$$

$$\therefore \quad (-5)\times(-4) = -(-5)-(-5)-(-5)-(-5)$$

$$= +5+5+5+5 \qquad \text{[Art. 28.]}$$

$$= +20.$$

We can proceed in a similar manner for any other numbers whether integral or fractional, positive or negative. Hence we have the following laws:

$$\left.\begin{aligned} a\times\ \ b &= +ab \text{.....(i)} \\ (-a)\times\ \ b &= -ab \text{.....(ii)} \\ a\times(-b) &= -ab \text{.....(iii)} \\ (-a)\times(-b) &= +ab \text{.....(iv)} \end{aligned}\right\} \text{.....}(\beta).$$

The rule by which we determine the signs of the products is called the **Law of Signs**: this law is sometimes enunciated briefly as follows:—*like signs give* +, *and unlike signs* −.

39. **The factors of a product may be taken in any order.**

It is proved in Arithmetic that when one number, whether integral or fractional, is multiplied by a second, the result is the same as when the second is multiplied by the first.

EXAMPLES. XXVII.

Find the factors of each of the following expressions:

1.	$3x^2-10x+3$.	2.	$3x^2-17x+10$.	3.	$2x^2+11x+12$.
4.	$2x^2+3x-2$.	5.	$3x^2+7x-6$.	6.	$4x^2+x-3$.
7.	$5x^2-38x+21$.	8.	$3x^2+11x-20$.	9.	$7x^2-33x-54$.
10.	$5x^2-38x+48$.	11.	$7x^2+75x-108$.	12.	$9x^2+130x-75$.
13.	$4x^2+21x-18$.	14.	$4x^2+4x-15$.	15.	$6x^2+55x-50$.
16.	$10x^2+3x-1$.	17.	$132x^2+x-1$.	18.	$4x^2-5x+1$.
19.	$12x^2+50x-50$.	20.	$7x^2+123x-54$.	21.	$24x^2-30x-75$.
22.	$x^2+4xy+3y^2$.	23.	$x^2-6xy+8y^2$.	24.	$x^2-11xy+18y^2$.
25.	$x^2+5xy-14y^2$.	26.	$x^2-25xy+150y^2$.	27.	$x^2-35xy-200y^2$.
28.	$3x^2-17xy+10y^2$.			29.	$7x^2-33xy-54y^2$.
30.	$24x^2-70xy-75y^2$.			31.	x^4-13x^2+36.
32.	$x^4-25x^2y^2+144y^4$.			33.	$36x^4-97x^2y^2+36y^4$.
34.	x^3-3x^2-18x.			35.	$x^3y-x^2y^2-2xy^3$.
36.	$15x^4y-4x^3y^2-4x^2y^3$.			37.	$75xy^3-130x^2y^4-9x^3y^5$.

102. It is clear that the method of finding by trial the factors of an expression of the form px^2+qx+r, where p, q, r are known numbers, would be very tedious if there were many pairs of numbers whose product was p and many pairs whose product was r, for there would then be very many pairs of factors which would agree with the given expression so far as the end terms were concerned, and out of these the single pair which would give the correct middle term would have to be sought. It would, for example, be almost impossible to find the factors of $2310x^2-2419x-9009$ in this way.

Again, we not unfrequently meet with such an expression as x^2+6x+7 which cannot be written as the product of two factors altogether rational, and in such a case it would be impracticable to try and guess the factors.

We therefore need some method of finding the factors of a quadratic expression which is applicable to all cases. This method we proceed to investigate.

[SPECIMEN PAGE]

157. It should be remarked that we cannot solve *any* two equations which are both of the second degree; for the elimination of one of the unknown quantities will frequently lead to an equation of higher degree than the second, from which the remaining unknown quantity would have to be found; and we cannot solve an equation of higher degree than the second, except in very special cases.

For example, if we have the equations $x^2+x+y=3$ and $x^2+y^2=5$. We have from the first equation $y=3-x-x^2$; and, by substituting this value of y in the second equation, we get

$$x^2+(3-x-x^2)^2=5,$$

that is $$x^4+2x^3-4x^2-6x+4=0;$$

and this equation of the fourth degree cannot be solved by any methods which are within the range of this book.

158. We can always solve two equations of the second degree when *all the terms which contain the unknown quantities are of the second degree.* The method will be seen from the following example.

Ex. 1. Solve the equations

$$x^2+3xy=28,$$
$$xy+4y^2=8.$$

Divide the members of the first equation by the corresponding members of the second equation; we then have

$$\frac{x^2+3xy}{xy+4y^2}=\frac{28}{8}=\frac{7}{2}.$$

Hence $$2(x^2+3xy)=7(xy+4y^2);$$

$$\therefore \quad 2x^2-xy-28y^2=0,$$

that is, $$(2x+7y)(x-4y)=0.$$

Hence $$x=4y, \text{ or } x=-\tfrac{7}{2}y.$$

I. If $x=4y$, we have from the second equation,

$$4y^2+4y^2=8; \quad \therefore \ y=\pm 1.$$

And therefore $$x=4y=\pm 4.$$

[SPECIMEN PAGE]

where

$$c_0 = c_n = 1,\ c_1 = c_{n-1} = n,\ \text{and}\ c_r = c_{n-r} = \frac{\lfloor n}{\lfloor r \lfloor n-r}.$$

I. Put $x = 1$ in the above formula; and we have

$$2^n = c_0 + c_1 + c_2 + \ldots + c_r + \ldots c_n.$$

Thus *the sum of the coefficients in the expansion of* $(1+x)^n$ *is* 2^n.

II. Again, put $x = -1$; and we have

$$(1-1)^n = c_0 - c_1 + c_2 - c_3 + \ldots;$$

$$\therefore\ 0 = (c_0 + c_2 + c_4 + \ldots) - (c_1 + c_3 + c_5 + \ldots).$$

Thus *the sum of the coefficients of the odd terms of a binomial expansion is equal to the sum of the coefficients of the even terms.*

III. Since $c_r = c_{n-r}$, [Art. 246] we may write the binomial theorem in either of the following ways:

$$(1+x)^n = c_0 + c_1 x + c_2 x^2 + \ldots + c_r x^r + \ldots c_n x^n,$$

$$\text{or}\ (1+x)^n = c_n + c_{n-1} x + c_{n-2} x^2 + \ldots c_{n-r} x^r + \ldots + c_1 x^{n-1} + c_0 x^n.$$

The coefficient of x^n in the product of the two series on the right is equal to

$$c_0^2 + c_1^2 + c_2^2 + \ldots + c_n^2.$$

Hence* $c_0^2 + c_1^2 + \ldots + c_r^2 + \ldots c_n^2$ is equal to the coefficient of x^n in $(1+x)^n \times (1+x)^n$, that is in $(1+x)^{2n}$, and this coefficient is $\frac{\lfloor 2n}{\lfloor n \lfloor n}$.

Hence *the sum of the squares* of the coefficients in the expansion of $(1+x)^n$ is equal to $\frac{\lfloor 2n}{\lfloor n \lfloor n}$.

* See Art. 272.

The values of A, B, C, ... can, however, be obtained *separately* in the following manner. Since (i) is to be true for *all* values of x, it must be true when $x = a$; and putting $x = a$, we have $F(a) = A(a-b)(a-c)\ldots$; and therefore $A = F(a)/(a-b)(a-c)\ldots$. Similarly we have

$$B = F(b)/(b-a)(b-c)\ldots;$$

and so for C, D, ...

We have thus found values of A, B, C, ... which make the relation (i) true for n values a, b, c,... of x; and as the expressions on the two sides of (i) are of not higher degree than the $(n-1)$th, it follows [Art. 272] that the relation is true for *all values* of x.

Thus

$$\frac{F(x)}{(x-a)(x-b)(x-c)\ldots} = \frac{F(a)}{(a-b)(a-c)\ldots}\cdot\frac{1}{x-a} + \ldots.$$

Ex. 1. Resolve $\dfrac{2x}{(x-1)(x-3)}$ into partial fractions.

Assume $$\frac{2x}{(x-1)(x-3)} \equiv \frac{A}{x-1} + \frac{B}{x-3};$$

then $$2x \equiv A(x-3) + B(x-1).$$

In this identity put $x=1$; then $2 = A(-2)$. Now put $x=3$; then $6 = B \cdot 2$.

Thus $$\frac{2x}{(x-1)(x-3)} = \frac{3}{x-3} - \frac{1}{x-1}.$$

Or, by equating the coefficients of the different powers of x, we have

$$2 = A + B, \text{ and } 0 = -3A - B;$$

whence, as before, $$A = -1,\ B = 3.$$

Ex. 2. Find the coefficient of x^r in the expansion of $\dfrac{2x}{x^2-4x+3}$ according to ascending powers of x.

[SPECIMEN PAGE]

144. A cask was filled with wine and water mixed together in the ratio of 5 : 3. When 16 gallons of the mixture had been drawn off and the cask filled up with water, the ratio of the wine to the water became 3 : 5. How many gallons did the cask hold?

145. Shew that, if

$$\frac{bx-ay}{cy-az}=\frac{cx-az}{by-ax}=\frac{z+y}{x+z},$$

then will each fraction be equal to $\frac{x}{y}$ unless $b+c=0$.

146. To each of three quantities in geometrical progression the second is added. Shew that the three resulting quantities are in harmonical progression.

147. Shew that, if a, b, c are in Arithmetical Progression and a, b, $c+1$ in Geometrical Progression, then will

$$a=(a-b)^2=(b-c)^2.$$

148. Shew that, if x and y are both positive and $x<\frac{1-y}{1+y}$, then will $y<\frac{1-x}{1+x}$.

149. Eliminate x and y from the equations

$$\frac{b}{x}+\frac{a}{y}=1, \quad \frac{x^2}{a^2}+\frac{y^2}{b^2}=2, \quad xy+ab=0.$$

150. Expand, in a series of ascending powers of x, each of the expressions $(1-x+x^2)^{-1}$ and $(1-x-2x^2)^{-1}$, and shew that, if p_n, q_n be the respective coefficients of x^n in the two series, then

$$3q_n-p_{2n}=2^{n+1}.$$

151. Shew that, if $2s=a+b+c$ and $2\sigma^3=a^3+b^3+c^3$, then will

$$(\sigma^3-a^3)(s-a)+(\sigma^3-b^3)(s-b)+(\sigma^3-c^3)(s-c)=a^4+b^4+c^4-s\sigma^3.$$

152. Shew that, if $x^2-a^2=y^2-b^2=z^2-c^2$,

then
$$\frac{bz-cy}{a-x}+\frac{cx-az}{b-y}+\frac{ay-bx}{c-z}=0.$$

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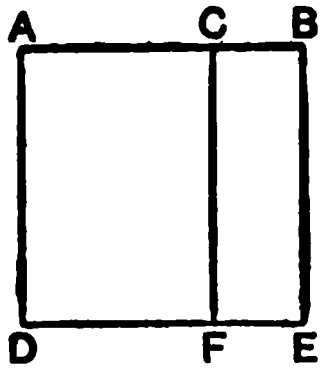
PROPOSITION 2. THEOREM.

If a straight line is divided into any two parts, the square on the whole line is equal to the sum of the rectangles contained by the whole line and each of the parts.



Let the straight line AB be divided at C into the two parts AC, CB.

Then shall the square on AB *be equal to the sum of the rectangles contained by* AB, AC *and by* AB, BC.

Construction. On AB describe the square ADEB. I. 46.
Through C draw CF par[l] to AD. I. 31.

Proof. Now the fig. AE is made up of the figs. AF, CE: and of these,

the fig. AE is the sq. on AB: *Constr.*

and the fig. AF is the rectangle contained by AB, AC; for it is contained by AD, AC; and AD = AB:

also the fig. CE is the rectangle contained by AB, BC; for it is contained by BE, BC; and BE = AB.

∴ the sq. on AB = the sum of the rectangles contained by AB, AC, and by AB, BC. Q.E.D.

CORRESPONDING ALGEBRAICAL FORMULA.

The result of this proposition may be written

$$AB^2 = AB \cdot AC + AB \cdot BC.$$

Let AC contain a units of length, and let CB contain b units,

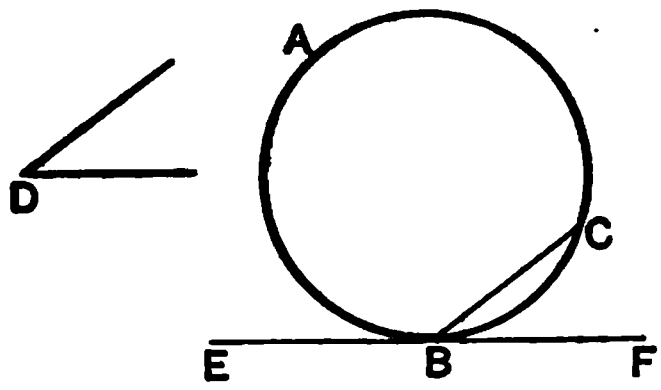
then $AB = a + b$ units;

and we have $(a+b)^2 = (a+b)a + (a+b)b.$

[SPECIMEN PAGE]

PROPOSITION 34. PROBLEM.

From a given circle to cut off a segment which shall contain an angle equal to a given angle.



Let ABC be the given circle, and D the given angle.

It is required to cut off from the ⊙ ABC *a segment which shall contain an angle equal to* D.

Construction. Take any point B on the ○ᵒᵉ,
and at B draw the tangent EBF. III. 17.
At B, in FB, make the ∠ FBC equal to the ∠ D. I. 23.
Then the segment BAC *shall contain an angle equal to* D.

Proof. Because EF is a tangent to the circle, and from B, its point of contact, a chord BC is drawn,
∴ the ∠ FBC = the angle in the alternate segment BAC.
III. 32.
But the ∠ FBC = the ∠ D; *Constr.*
∴ the angle in the segment BAC = the ∠ D.
Hence from the given ⊙ ABC a segment BAC has been cut off, containing an angle equal to D. Q.E.F.

EXERCISES.

1. The chord of a given segment of a circle is produced to a fixed point: on this straight line so produced draw a segment of a circle similar to the given segment.

2. Through a given point without a circle draw a straight line that will cut off a segment capable of containing an angle equal to a given angle.

QUESTIONS FOR REVISION.

1. Enunciate the propositions from which we infer that a straight line and a circle must either

(i) intersect in two points ; or
(ii) touch at one point ; or
(iii) have no point in common.

2. Give two independent constructions for drawing a tangent to a circle from an external point.

Shew that the two tangents so drawn

(i) are equal ;
(ii) subtend equal angles at the centre ;
(iii) make equal angles with the straight line which joins the given point to the centre.

3. Enunciate propositions relating to

(i) angles in a segment of a circle ;
(ii) similar segments of circles.

4. What are *conjugate arcs* of a circle ?

The angles in conjugate segments of a circle are supplementary. How does Euclid enunciate this theorem ? State and prove its converse.

5. Explain what is meant by a *reflex angle.* What simplifications may be made in the proofs of Third Book Propositions if reflex angles are admitted ?

6. If the circumference of a circle is divided into six equal arcs, shew that the chords joining successive points of division are all equal to the radius of the circle.

7. Find the locus of the centres of all circles

(i) which pass through two given points ;
(ii) which touch a given circle at a given point ;
(iii) which are of given radius, and touch a given circle ;
(iv) which are of given radius, and pass through a given point ;
(v) which touch a given straight line at a given point ;
(vi) which touch each of two parallel straight lines ;
(vii) which touch each of two intersecting straight lines of unlimited length.

8. If a system of triangles stand on the same base and on the same side of it, and have equal vertical angles, shew that the locus of their vertices is the arc of a circle. Prove this theorem, having first enunciated the proposition of which it is the converse.

THEOREM 11. **Alternando, or Alternately.** *If four magnitudes of the same kind are proportionals, they are also proportionals when taken alternately.*

That is, if $a : b = x : y,$

then shall $a : x = b : y.$

For, by hypothesis, $\frac{a}{b} = \frac{x}{y}.$

Multiplying both sides by $\frac{b}{x},$

we have $\frac{a}{b} \cdot \frac{b}{x} = \frac{x}{y} \cdot \frac{b}{x};$

that is, $\frac{a}{x} = \frac{b}{y},$

or $a : x = b : y.$

NOTE. In this theorem the *hypothesis* requires that a and b shall be of the same kind, also that x and y shall be of the same kind; while the *conclusion* requires that a and x shall be of the same kind, and also b and y of the same kind.

THEOREM 12. **Addendo.** *In a series of equal ratios (the magnitudes being all of the same kind), as any antecedent is to its consequent so is the sum of the antecedents to the sum of the consequents.*

That is, if $a : x = b : y = c : z = \ldots;$

then shall $a : x = a + b + c + \ldots : x + y + z + \ldots.$

Let each of the equal ratios $\frac{a}{x}, \frac{b}{y}, \frac{c}{z} \ldots$ be equal to $k.$

Then $a = kx, \quad b = ky, \quad c = kz, \quad \ldots;$

$\therefore$, by addition,

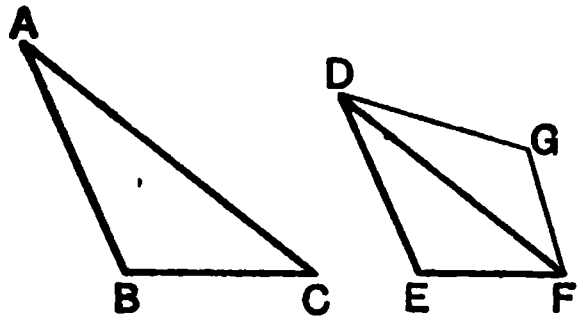
$$a + b + c + \ldots = k(x + y + z + \ldots);$$

$$\therefore \frac{a + b + c + \ldots}{x + y + z + \ldots} = k = \frac{a}{x},$$

or $a : x = a + b + c + \ldots : x + y + z + \ldots.$

PROPOSITION 6. THEOREM.

If two triangles have one angle of the one equal to one angle of the other, and the sides about the equal angles proportionals, the triangles shall be similar.



In the △ˢ BAC, EDF, let the ∠ BAC = the ∠ EDF,
and let BA : AC :: ED : DF.

Then shall the △ˢ BAC, EDF *be similar.*

At D in FD make the ∠ FDG equal to the ∠ CAB: I. 23.
at F in DF make the ∠ DFG equal to the ∠ ACB;
∴ the remaining ∠ DGF = the remaining ∠ ABC. I. 32.

Then the △ˢ BAC, GDF are equiangular to one another;
∴ BA : AC :: GD : DF. VI. 4.
But, *by hypothesis*, BA : AC :: ED : DF;
∴ GD : DF :: ED : DF,
∴ GD = ED.

Then in the △ˢ GDF, EDF,
Because { GD = ED,
and DF is common;
and the ∠ GDF = the ∠ EDF; *Constr.*
∴ the △ˢ GDF, EDF are equal in all respects; I. 4.
so that the △ EDF is equiangular to the △ GDF;
but the △ GDF is equiangular to the △ BAC; *Constr.*
∴ the △ EDF is equiangular to the △ BAC;
∴ their sides about the equal angles are proportionals; VI. 4.
that is, the △ˢ BAC, EDF are similar.

Q.E.D.

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THE ELEMENTS OF EUCLID

FOR THE USE OF SCHOOLS AND COLLEGES

WITH NOTES, AN APPENDIX, AND EXERCISES

BY

I. TODHUNTER, D.Sc., F.R.S.

NEW EDITION, REVISED AND ENLARGED

BY

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PREFACE

In preparing a new edition of the late Dr. Todhunter's *Euclid*, the following are the principal alterations and additions that I have made:

(1) The text of the Propositions has been simplified and shortened. A sparing use has been made of symbols in the place of constantly recurring words. Some of the proofs (*e.g.* II. 13) have been altered in accordance with modern usage, but this has always been done subject to the regulations at present in force in the Universities of Oxford and Cambridge.

(2) Considerable trouble has been taken to arrange the book so that, with very few exceptions, each Proposition is commenced on a fresh page, and may be read by the student without his turning over a leaf.

(3) The proofs of Book V. have been much shortened. To them, and also to the proofs of Book II., the corresponding algebraic formulae have been added.

(4) The more important of Dr. Todhunter's Notes have been appended to the Propositions to which they refer.

(5) The total number of Exercises has been doubled.

(6) The easier of the Exercises in the previous edition, and a large number of additional ones, have been classified and follow, in the Text, the Propositions on which they depend. The more important of these have asterisks prefixed to them, and, as far as possible, their results should be remembered by the student as part of his geometrical knowledge.

(7) All through the book, with the exception of the Exercises at the end, which are left to the student, hints have been annexed to the more difficult and more important Exercises.

(8) The Appendix has been more than doubled in quantity, and the theorems in it have been classified according to the Book to which they refer and on which they depend; a large number of Exercises has been incorporated in it.

(9) Sections have been added dealing with Poles and Polars, Orthogonal Circles, Pedal Triangles, The Pedal Line, The Nine-Point Circle, Co-axal Circles, Harmonic Ranges, Inversion, and the Properties of a Complete Quadrilateral.

Out of the large number of Propositions on these subjects it is clear that only a selection could be made, but I have endeavoured within the range chosen to omit no important Proposition. Without unduly increasing the size of the book it was impossible to prove all such important Propositions in the text. It is hoped, however, that the hints attached to those given as Exercises will be sufficient for any fairly intelligent student.

For any corrections of misprints or errors, or any suggestions for improvement, I shall be very grateful.

S. L. LONEY.

CONTENTS

Books I., II., III., IV., V., VI., XI., XII., Notes.

APPENDIX

Book I. Theorems and Examples—On Geometrical Analysis—On Loci—Maxima and Minima.

Book II. Theorems and Examples.

Book III. A Tangent as a Limit—Common Tangents—Loci—Poles and Polars—Orthogonal Circles.

Book IV. Pedal Triangles, etc.—Pedal Line—Nine-Point Circle—Tangencies of Circles—Constructions—Maxima and Minima.

Book VI. Radical Axis—Co-axal Circles—Loci—Centres of Similitude—Constructions—Harmonic Ranges—Inversion—Transversals—Complete Quadrilaterals—Co-polar and Co-axal Triangles.

EXERCISES

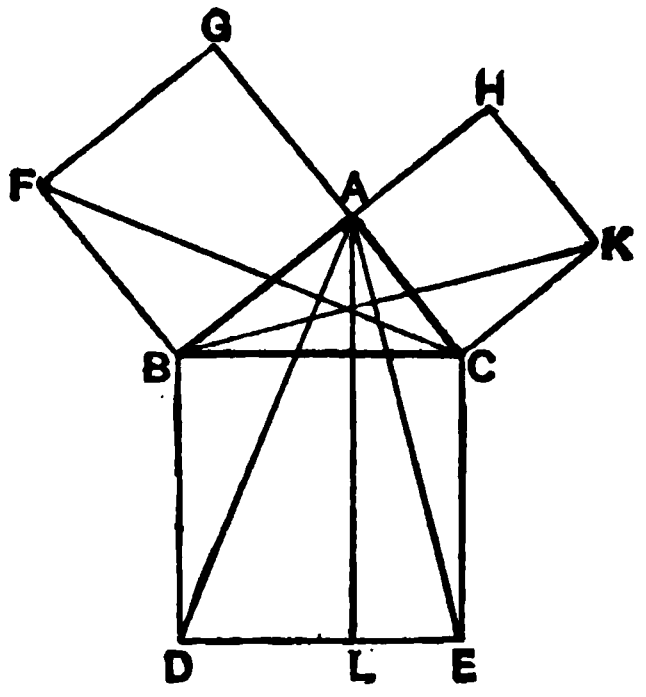
Books I., II., III., IV., VI., XI., Miscellaneous.

Proposition 47. Theorem.

In any right-angled triangle the square which is described on the side subtending the right angle is equal to the squares described on the sides which contain the right angle.

Let ABC be a right-angled triangle, having the right angle BAC;

the square described on the side BC *shall be equal to the squares described on the sides* BA, AC.



Construction. On BC describe the square BDEC, and on BA, AC describe the squares BFGA, AHKC; [I. 46.
through A draw AL parallel to BD or CE, [I. 31.
and join AD, FC.

Proof. Because the angle BAC is a right angle, [*Hypothesis.*
and that the angle BAG is also a right angle; [*Definition* 31.
∴ CA is in the same straight line with AG. [I. 14.
Similarly, AB and AH are in the same straight line.
Now the angle DBC = the angle FBA,
for each of them is a right angle; [*Axiom* 11.
add to each the angle ABC.
∴ the whole angle DBA = the whole angle FBC. [*Axiom* 2.

[Let ABCDEF... be the polygon and O the centre of the circle.
The $\angle ABC = 2$ rt. $\angle^s - \frac{1}{2}\angle AOC$; $\angle CDE = 2$ rt. $\angle^s - \frac{1}{2}\angle COE$, etc.;
$\therefore$ on addition, the sum of the alternate angles
$= 2$ rt. $\angle^s \times \frac{1}{2}$ no. of the sides $- \frac{1}{2}$ all the $\angle^s$ at O = etc.]

6. Shew that the four straight lines bisecting the interior (or the exterior) angles of any quadrilateral form a quadrilateral which can be inscribed in a circle.

[Let the bisectors of the interior angles A and B, B and C, C and D, D and A of a quadrilateral meet in E, F, G, H. Then

$$\angle FEH = 2 \text{ rt. } \angle^s - \tfrac{1}{2}\angle A - \tfrac{1}{2}\angle B,$$
$$\text{and } \angle FGH = 2 \text{ rt. } \angle^s - \tfrac{1}{2}\angle C - \tfrac{1}{2}\angle D;$$

.. $\angle^s$ FEH, FGH = 4 rt. $\angle^s$ − half the sum of the interior angles of ABCD
$= 4$ rt. $\angle^s - 2$ rt. $\angle^s = 2$ rt. $\angle^s$; $\therefore$ etc.
Similarly for the bisectors of the exterior angles.]

****7.** Shew that no parallelogram except a rectangle can be inscribed in a circle.

8. D is any point on the arc BC of a circle whose centre is A; CD is produced to E; prove that the angle BDE is half the angle BAC.

9. AOB is a triangle; C and D are points in BO and AO respectively, such that the angle ODC is equal to the angle OBA; shew that a circle may be described round the quadrilateral ABCD.

10. ABCD is a quadrilateral inscribed in a circle, and the sides AB, DC when produced meet at O; shew that the triangle AOC is equiangular to the triangle BOD, and the triangle AOD to the triangle BOC.

****11.** If any two consecutive sides of a hexagon inscribed in a circle be respectively parallel to their opposite sides, the remaining sides are parallel to each other.

[Let ABCDEF be the hexagon having FA, AB parallel to CD, DE. Then $\angle FEB = 2$ rt. $\angle^s - \angle FAB$ [III. 22] $= 2$ rt. $\angle^s -$ DEC [I. 29] $= \angle EBC$.

12. ABCD is a quadrilateral inscribed in a circle; AB and CD meet in P; AD and BC meet in Q; prove that the bisectors of the angles P and Q are at right angles.

[If O be the intersection of the bisectors, and OQ meet CD in L, then

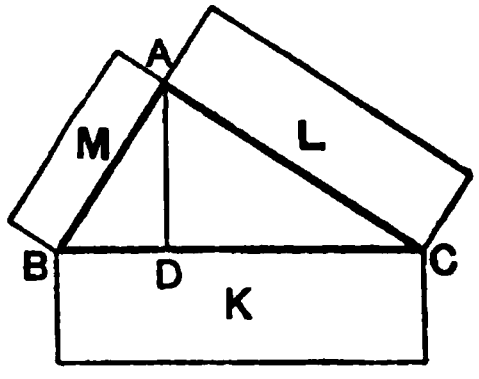
$$\angle OPC = \tfrac{1}{2}D - \tfrac{1}{2}PAD \text{ and } \angle OQD = \tfrac{1}{2}D - \tfrac{1}{2}DCQ;$$
$$\therefore \angle POQ = \angle PLQ - \angle OPC = \angle D - \angle OQD - \angle OPC$$
$$= \angle D - \tfrac{1}{2}(2\angle D - \angle PAD - \angle PCQ)$$
$$= \tfrac{1}{2}\angle PAD + \tfrac{1}{2}\angle PCQ = \text{a rt. } \angle.]$$

[SPECIMEN PAGE]

PROPOSITION 31. THEOREM.

In any right-angled triangle, any rectilineal figure described on the side subtending the right angle is equal to the similar and similarly described figures on the sides containing the right angle.

Let ABC be a triangle, right-angled at A:
the rectilineal figure described on BC *shall be equal to the similar and similarly described figures on* BA *and* CA.



Construction. Draw the perpendicular AD. [I. 12.

Let K, L, M be the similar and similarly described figures on BC, CA, and AB.

Proof. Because AD is drawn from the right angle A perpendicular to BC,

the $\triangle$CBA is similar to the $\triangle$ABD; [VI. 8.

$\therefore$ BC : BA :: BA : BD; [VI. *Def.* 2.

$\therefore$ BC : BD :: K : M; [VI. 20, *Cor.* 2.

and inversely, BD : BC :: M : K. [V. *B.*

Similarly, CD : BC :: L : K;

$\therefore$ as BD and CD together are to BC so are L and M together to K. [V. 24.

But BD and CD together = BC;

$\therefore$ the figure K = the figures L and M. [V. *A.*

Wherefore, *in any right-angled triangle, etc.* [Q.E.D.

Note. Of this general proposition I. 47 is a particular case.

EXERCISES.

****1.** The straight line joining two points, A and B, is the polar of the point of intersection of the polars of A and B.

[Let the latter intersect at T; then A lies on the polar of T, since T lies on the polar of A (43); so B lies on the polar of T; ∴ AB is the polar of T.]

****2.** The point of intersection of any two straight lines is the pole of the straight line joining their poles.

****3.** Find the locus of the poles of all straight lines which pass through a given point. [Use Art. 43.]

****4.** A and B are two points in a plane of a circle whose centre is C; AX and BY are the perpendiculars from A and B on the polars of B and A respectively; prove that the rectangles CA . BY and CB . AX are equal. [Salmon's Theorem.]

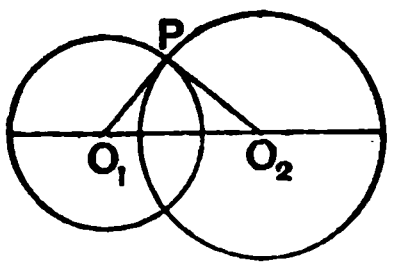
[Let the polar of A meet CA in M, and that of B meet CB in N; also draw AU, BV perp^r to CB, CA respectively.

Then A, V, U, B lie on a circle; ∴ CU . CB=CA . CV. [III. 36.

But CN . CB=CM . CA=sq. on radius (Art. 42). Subtract;

∴ CB . NU=CA . MV, *i.e.* CB . AX=CA . BY.]

44. Orthogonal Circles. Def. Two circles are said to intersect orthogonally when the tangents at their points of intersection are at right angles.



If the two circles intersect at P, the radii O_1P and O_2P, which are perpendicular to the tangents at P, must also be at right angles.

Hence $$O_1O_2^2=O_1P^2+O_2P^2,$$

i.e. the square of the distance between the centres must be equal to the sum of the squares of the radii.

Also the tangent from O_2 to the other circle is equal to the radius a_2, *i.e. if two circles be orthogonal the length of the tangent drawn from the centre of one circle to the second circle is equal to the radius of the first.*

Either of these two conditions will determine whether the circles are orthogonal.

It follows that if we want the circle whose centre is O_2 which shall cut a given circle, centre O_1, orthogonally, we must take its radius equal to the tangent from O_2 to the given circle.

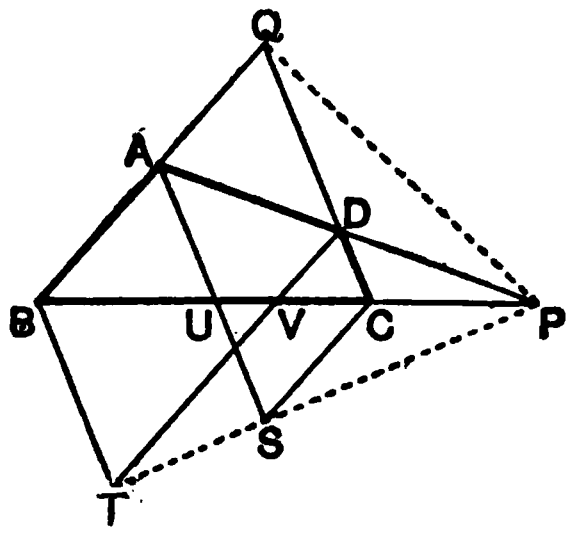
COMPLETE QUADRILATERALS.

106. Let ABCD be an ordinary Euclidean quadrilateral. Let AD and BC be produced to meet in P, and let AB and CD meet in Q. The figure is now said to be a complete quadrilateral, since it gives all the points of intersection of the four lines AB, BC, CD, DA produced indefinitely.

The straight line PQ is called the third diagonal, the other two being AC and BD.

Also, if AC, BD meet in R, then P, Q, and R are called the three vertices.

107. *The middle points of the diagonals of a complete quadrilateral lie on a straight line.*



Complete the parallelograms QASC, QBTD.

Let AS, DT meet BP in U and V.

Then PC : CU :: PD : DA, since CD, UA are $\|^{l}$,

i.e. :: PV : VB, since VD, BA are $\|^{l}$;

$\therefore$ PC : PV :: CU : VB,

:: CS : VT, since CUS, VBT are similar Δ^{s};

$\therefore$ PST is a straight line;

$\therefore$ the middle points of QP, QS, QT are in a straight line parallel to PST. [Art. 24.

But since QBTD, QASC are $\|^{gms}$, the middle points of QT, QS are the middle points of BD, AC;

$\therefore$ the middle points of the three diagonals BD, AC, QP lie on a straight line.

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EUCLID'S ELEMENTS OF GEOMETRY

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EDITED FOR THE USE OF SCHOOLS

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EXTRACTS FROM THE PREFACE

THE following is the first instalment of a School Edition of Euclid's Elements of Geometry. The subject is treated in Euclid's order and manner, but with no special regard for the exact words of Simson's translation, which appears to have been scrupulously followed by many English editors.

Further explanation has been given whenever this appeared to be necessary or desirable, and we have not hesitated occasionally to give proofs different from those of Euclid.

The changes we have made in Book II. are more considerable than in Book I. We have substituted for Euclid's proofs of Props. 9 and 10 the proof in which the equality to be established is shewn directly from the diagram. Proofs of II. 12 and II. 13 are also given in which the equality that has to be established is proved at once from the diagram. These proofs might be given immediately after I. 47, as in Lardner's Euclid, where, so far as we can discover, these interesting and instructive extensions of I. 47 first appear.

The second book of Euclid is often found to be difficult and distasteful to beginners; we hope, however, that the changes we have ventured to introduce, and the explanations and additions we have given, will make the study of this important section of Geometry more attractive and more valuable.

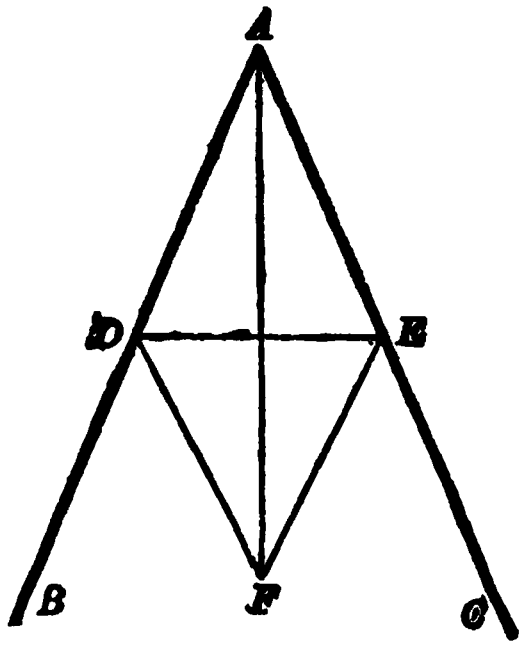
A few additional propositions have been given in the text; and in a note following each book we have grouped together the other important theorems with which the student should make himself familiar on a second reading. Most of the examples which are given under the different propositions are very simple, and could be solved by an average well-taught student quite early in his study of Geometry.

Abbreviations and symbols for words have been used at an early stage, because the different steps of the reasoning are more easily followed when contractions are employed; and, when students are themselves required to write out proofs, it is of the utmost importance that each of the different steps of the proof should be made to stand out as clearly as possible by the use of abbreviations.

PROPOSITION IX. Problem.

To bisect a given angle, that is, to divide it into two equal angles.

Let BAC be the given angle, *it is required to divide it into two equal angles.*



Const. In AB take any point D, and from AC cut off a part AE equal to AD. Join DE.

On the side of DE remote from A describe the equilateral triangle DFE, and join AF.

Then the straight line AF will bisect the angle BAC.

Proof. In the triangles ADF and AEF,

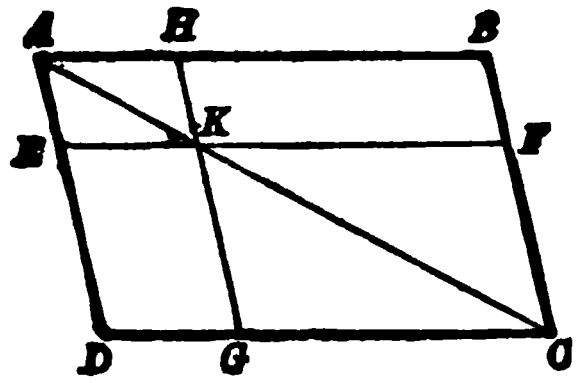
$$\because \begin{cases} AD = AE, & [\textit{Const.} \\ AF = AF, & \\ \text{and } DF = EF; & [\textit{Const.} \end{cases}$$

$\therefore$ the Δ^s ADF and AEF are equal in all respects, and in particular [I. 8.

$$\angle DAF = \angle EAF.$$

Therefore *the angle BAC is bisected by AF.*

The equilateral triangle DFE is constructed on the side of DE remote from A, for the construction would otherwise fail if DAE happened to be itself an equilateral triangle. If, however, DAE is not an equilateral triangle, DFE can be on either side of DE.



Since every ||^{m} is bisected by its diagonal,

$$\Delta\, ABC = \Delta\, ADC,$$

$$\Delta\, AHK = \Delta\, AEK,$$

and $$\Delta\, KFC = \Delta\, KGC.$$

From $\Delta\, ABC$ take the sum of the Δ^{s} AHK and KFC, and from the Δ ADC take the sum of the Δ^{s} AEK and KGC; then the remainders will be equal.

Hence $$||^{m}\, HF = ||^{m}\, KD.$$

It should be noticed that the converse of this theorem is true, namely:—

'If any ||^{m} be divided into four ||^{ms} by two lines || respectively to two adjacent sides; then if two opposite ||^{ms} be equal, the other two ||^{ms} will be about a diagonal of the given ||^{m}.'

Let GE, EH, HF, FG be the four ||^{ms} into which ||^{m} AC is divided by lines || to adjacent sides, and let ||^{m} EG=||^{m} FH. Then we have to prove that AKC is a st. line.

For, if AKC is not a st. line, let AK cut DC in the point X. Draw XY || to AD and cutting AB in Y. Then the complements GE and KY are equal. Hence ||^{m} KY=||^{m} KB, which is impossible. Hence AKC must be a straight line.

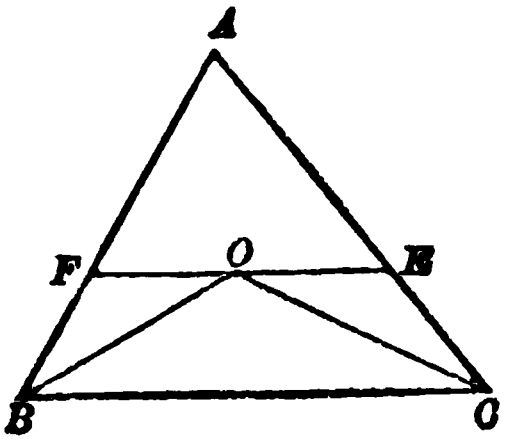
Ex. 1. Shew that each of the parallelograms about the diagonal of a rhombus, is a rhombus.

Ex. 2. Shew that each of the parallelograms about the diagonal of a rectangle, is a rectangle.

Ex. 3. Shew that the parallelograms DH and AF are equal.

Ex. 4. Shew that the parallelograms EC and GB are equal.

Ex. 1. ***Draw a line parallel to the base BC of the triangle ABC and cutting the sides AB, AC in the points F, E respectively so that FE may be equal to the sum of BF and CE.***



[Suppose the line FE to be drawn as required.

Then it naturally suggests itself to take the point O on FE such that $FO = BF$, and therefore $OE = EC$.

Then, since $BF = FO$, if BO be joined, $\angle FOB = \angle FBO$.

But, since FOE is $\parallel$ to BC, $\angle FOB = \angle OBC$.

Hence O must be *on the line bisecting the angle ABC.*

Similarly O must be *on the line bisecting the angle ACB.*

Hence the required line can be drawn by the following construction*.]

Const. Bisect the angles ABC, ACB by the lines BO and CO, and through O, the point of intersection of these bisectors, draw a line parallel to BC and cutting AB, AC in F, E respectively.

Then, by construction, $\angle FBO = \angle OBC$,

and, $\because$ $BC \parallel$ to FO,

$\angle OBC = \angle FOB$;

$\therefore$ $\angle FBO = \angle FOB$;

$\therefore$ $FO = FB$.

Similarly $OE = EC$, and $\therefore$ $FE = BF + CE$.

Ex. 2. ***Draw through any point P within the angle XOY a straight line cutting the lines OX, OY in the points Q, R respectively so that*** $QP = PR$.

* In future the 'analysis' will be put in brackets, as in this case.
The student will find it necessary, in all except the very simplest cases, to make an Analysis; this need not, however, be written out for an examiner in addition to the Synthesis.

Since AC is the difference between AB and BC, the above proposition can be enunciated in the following more interesting form:—

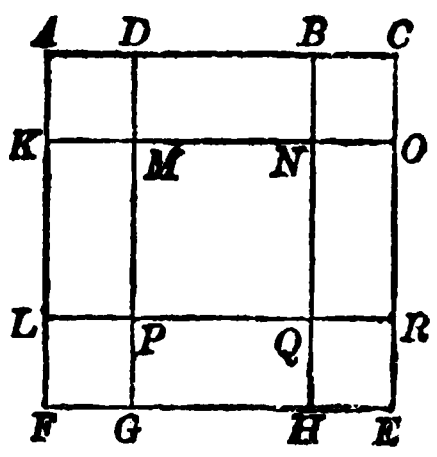
'*The square on the difference of any two straight lines is less than the sum of the squares on the lines by twice the rectangle contained by them.*'

Ex. 1. Shew that the sum of the squares on two straight lines is never less than twice the rectangle contained by them.

Ex. 2. Shew that the sum of the squares on two straight lines is never less than half the square on the sum of the lines.

PROPOSITION VIII. THEOREM.

The square on the sum of two straight lines exceeds the square on their difference by four times the rectangle contained by the lines.



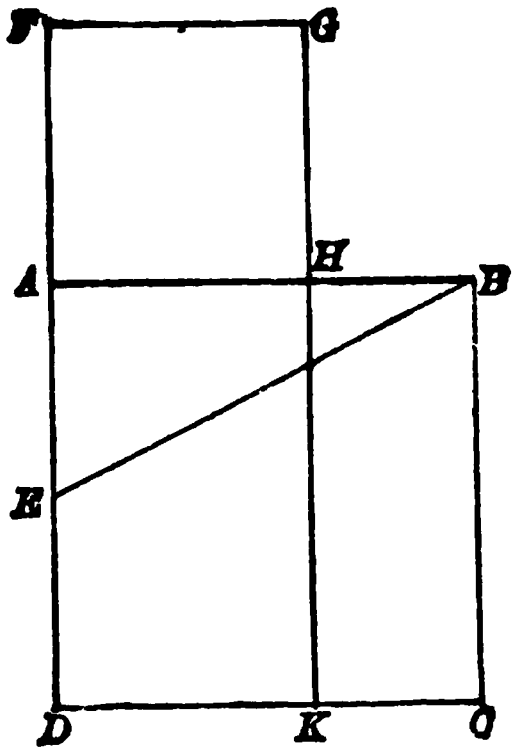
Let AB and BC be the two given straight lines, placed so that ABC is a straight line.

Cut off from AB a part AD equal to BC.

Then AC is the sum of the given lines and DB is the difference. *It is required to prove that sq. on AC exceeds the square on DB by four times the rect. AB, BC.*

On AC describe the square $ACEF$. Through D, B draw lines parallel to AF meeting FE in G, H respectively.

From AF cut off $AK = AD$ and $FL = AD$.



But figure FK is rect. DF, FA, since $FG = FA$.

Hence figure FK = sq. AC.

From these equals take away the fig. AK which is common; then

fig. FH = fig. HC.

But fig. FH is a square, and is $\therefore$ the sq. on AH, and fig. HC is equal to rect. AB, HB, for $BC = AB$.

Hence sq. on AH = rect. AB, BH.

Def. When a straight line is divided into two parts so that the rectangle contained by the whole line and one of the parts is equal to the square on the other part, the line is said to be divided in '**medial section.**' The line is also said to be divided in '**extreme and mean ratio,**' for in this case, as will be seen in Book VI, the ratio of the whole line to one part is equal to the ratio of that part to the other.

The analysis [see page 101] of this problem will shew how the above construction could be invented, and will enable the student to solve other analogous problems.

Analysis. Suppose that AB is divided in the required manner at the point H. Construct $AFGH$, the square on AH, and also the rectangle HB, BA, *these being put on opposite sides of the line* AB, as in the figure.

Then it is natural to complete the square AB, and as FK is equal to AC, we see that DA is to be produced to F so that the rectangle contained by the whole line produced and the part produced may be equal to the square on AB. Thus the problem is reduced to a particular case of that considered in Prop B.

[SPECIMEN PAGE]

Ex. 1. If in the diagram to Prop. XI, CB and FG are produced to meet in R, shew that DHR is a straight line.

Ex. 2. Shew that, if the lines GB, FC and AK be drawn, they will all be parallel.

Ex. 3. If FC cut AB, HK in P, Q respectively; then $FP=QC$.

Ex. 4. $\parallel^m GC=\parallel^m FB=\parallel^m AK$.

Ex. 5. The lines KF and HC are parallel.

Ex. 6. If KF cut AH in the point X, $HX=BH$.

Ex. 7. FB is $\perp^r$ to DH.

Ex. 8. If DH and EB intersect in O, AO is parallel to FB, and perpendicular to DH.

Ex. 9. The square on EF is five times the square on EA.

Ex. 10. The sum of the squares on AB and BH is three times the square on AH.

Ex. 11. The square on the sum of AB and BH is five times the square on AH.

Ex. 12. The difference of the squares on AH and HB is equal to the rectangle AH, HB.

Ex. 13. If, in the figure to Euclid II. 11, a point L be taken on ED produced such that $EL=EB$, and if a square $ALMN$ be described so that the squares AC and AM are on opposite sides of ADL; shew that the line BA will be divided externally at N so that sq. on AN is equal to rectangle BA, BN.

Ex. 14. If X be taken on HA such that $HX=HB$, then square on HX is equal to the rectangle HA, AX.

[This result is important. It shews that if a straight line be divided in medial section, and if the lesser segment be cut off from the greater, this latter is thereby divided in medial section. And this process can be continued.]

Ex. 15. DF is divided in medial section at A.

Ex. 16. DR is divided in medial section at H.

Ex. 17. GX is parallel to DH.

Ex. 18. Divide a straight line into two parts such that the sum of the squares on the whole line and one part may be equal to three times the square on the other part.

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ON I. 6

(*a*) Prove the corollary to this proposition.

(*b*) ABC is an isosceles triangle with AB equal to AC; the bisectors of the angles ABC and ACB meet at O. Prove that CO is equal to BO, and thence prove that the triangles AOB, AOC are equal in all respects.

(*c*) SPQR is a square, and PT, QT are drawn so as to make equal angles with PQ: show that ST is equal to TR.

(*d*) ABC is an isosceles triangle; equal parts AD, AE are cut off from the equal sides AB, AC respectively; BE, CD intersect at F: prove that FBC is an isosceles triangle.

(*e*) ABCD is a quadrilateral having AB equal to AD and each of the angles ABC, ADC a right angle. Prove that BC is equal to CD.

ON I. 7

(*a*) Can there be two equilateral triangles on the same base and on the same side of it?

(*b*) If two points be taken on the same side of a given straight line such that they are equidistant from a given point in that line, they cannot be equidistant from any other point in that line.

(*c*) Show that the beams of a roof keep the ridge in a fixed position.

(*d*) Two circles cannot intersect at more than one point on the same side of the line which joins their centres. (Employ the *reductio ad absurdum* method and suppose that they do.)

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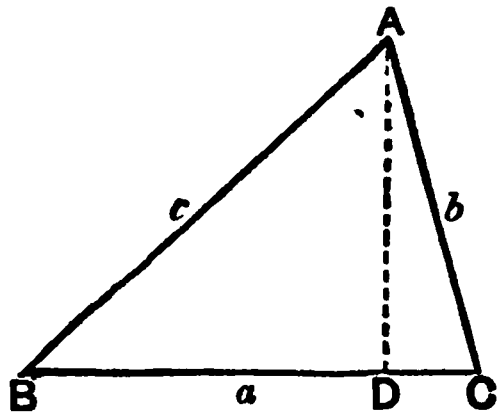
CHAPTER IV.

ON THE AREA OF TRIANGLES.

60. In a triangle ABC it is usual to adopt the letters a, b, c to denote the *lengths* of the sides opposite to the vertices A, B, C. Thus we may suppose that BC measures a units of length, CA b units, and AB c units.

Taking BC as the base of the triangle, then the perpendicular AD is called the altitude.



61. *To find the area of a triangle, having given the base and altitude.*

RULE. *The area of a triangle* $= \frac{1}{2}$ *base* $\times$ *altitude.*

NOTE.—This rule is derived from Euclid I. 41, where it is proved that *the area of a triangle is half the area of a rectangle on the same base and of the same altitude.*

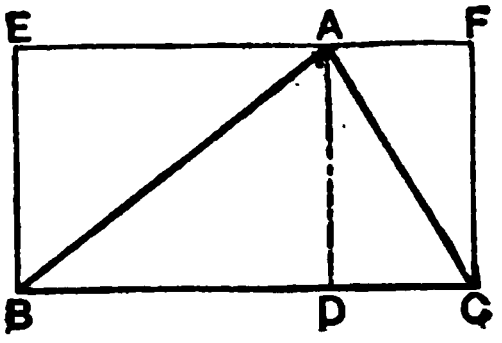
Thus in the adjoining figure:

The area of the triangle ABC

$= \frac{1}{2}$ area of rectangle EBCF

$= \frac{1}{2}$ length BC $\times$ breadth EB

$= \frac{1}{2}$ base BC $\times$ altitude AD.



Example. Find the area of a triangle whose base is 16 chains 15 links, and whose altitude is 2 chains 50 links.

Here *area of triangle* $= \frac{1}{2}$ *base* $\times$ *altitude*

$= \frac{1}{2} \times 16{\cdot}15 \times 2{\cdot}5$ sq. chains

$= 20{\cdot}1875$ sq. chains

$= 2{\cdot}01875$ ac.

$= 2$ ac. 0 r. 3 p.

16·15
2·5
8230
8075
2|40375
20·1875

[SPECIMEN PAGE]

121. The process may now be illustrated by an example.

Example. Find the volume of a rectangular block of granite whose length is 5 ft. 3′ 8″, breadth 3 ft. 5′, and thickness 2 ft. 4′.

Length,	5 ft.	3′	8″		
Breadth,	3 ft.	5′			
	15 sq. ft.	11′	0″		
	2 sq. ft.	2′	6″	4‴	
Area of base,	18 sq. ft.	1′	6″	4‴	
	2 ft.	4′			
	36 cubic ft.	3′	0″	8‴	
	6 cubic ft.	0′	6″	1‴	4⁗
Volume,	42 cubic ft.	3′	6″	9‴	4⁗ = 42 cubic ft. 513⅜ cubic in.

EXAMPLES XIII. B.

On Duodecimal Multiplication.

1. Find the volume of the rectangular solids in which
   (i.) the length is 3 ft. 4 in., the breadth 2 ft. 9 in., the thickness 1 ft. 4 in. ;
   (ii.) the length is 5 ft. 5 in., the breadth 3 ft. 9 in., the thickness 2 ft. 8 in. ;
   (iii.) the length is 6 ft. 7 in., the breadth 2 ft. 5 in., the thickness 1 ft. 2 in. 3 pts. ;
   (iv.) the length is 15 ft. 4 in., the breadth 1 ft. 5′ 3″, the thickness 8′ 4″.

2. How many cubic yards of masonry are there in a work in which 2160 blocks of stone have been used, each measuring 1 ft. 4′ 3″ in length, 1 ft. 2′ in breadth, and 10′ 8″ in thickness?

3. Find the weight of a deal beam 18 ft. long, 9 in. wide, and 6 in. 4 pts. thick, if one cubic foot of deal weighs 57 lbs.

4. Find the approximate weight of a granite block whose dimensions are 2 ft. 5 in., 1 ft. 2 in. 4 pts., and 9 in., it being given that one cubic foot of granite weighs 166 lbs. Give the result true to the nearest pound.

5. Find to the nearest gallon the contents of a rectangular cistern whose dimensions are 5 ft. 5 in., 4 ft. 3 in., and 3 ft. 7 in., it being given that 1 cubic ft. = 6¼ galls.

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NOTE. The above definition refers only to a *right circular cone*. Cones may exist whose axes are not perpendicular to their bases, and whose bases are not circular. Such cones, however, are beyond the scope of the present text-book.

101. *To find the surface and volume of a cone.*

In the adjoining figure let the height AB = h units of length, the radius of the base BC = r, and the *slant height* AC = l.

Then from the right-angled $\triangle$ABC,

$$AC^2 = AB^2 + BC^2;$$

or, $$l^2 = h^2 + r^2; \quad \therefore \ l = \sqrt{h^2 + r^2}.$$

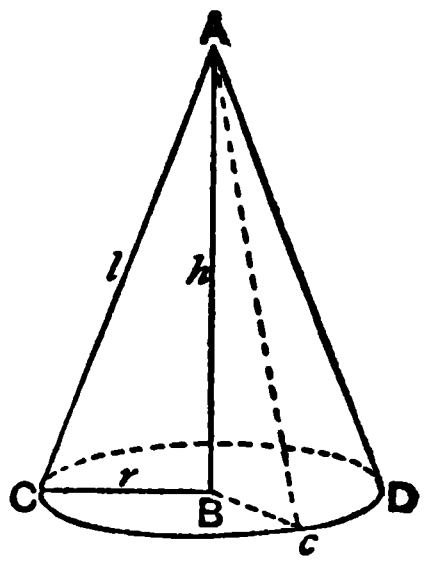
(i) *The curved surface of cone*

$$= \frac{1}{2}(\textit{circumference of base})$$

$$\times (\textit{slant height})$$

$$= \frac{1}{2} \cdot 2\pi r \times l$$

$$= \pi r l \text{ square units.}$$



The *whole surface* of cone = curved surface + area of base

$$= \pi r l + \pi r^2$$

$$= \pi r (l + r).$$

Again, it may be shewn that the volume of a cone is *one-third* the volume of the cylinder on the same base and of the same height;

$$\therefore \text{ (ii) } \textit{the volume of cone} = \frac{1}{3}(\textit{area of base}) \times \textit{height}$$

$$= \frac{1}{3}\pi r^2 h \text{ cubic units.}$$

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PREFACE TO THE SECOND EDITION

THIS little book has been entirely rewritten for this Second Edition. It now contains (without the Appendix) only that portion of the Trigonometry of One Angle which is required in the Cambridge Previous Examination. It is hoped that it may be found useful as a very simple introduction to the study of Trigonometry.

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Example 1. *In a right-angled triangle, in which C is the right angle, A is* 30° *and BC is* 10 ft. ; *solve the triangle.*

Here, $B = 180° - 90° - 30° = \underline{60°}$,

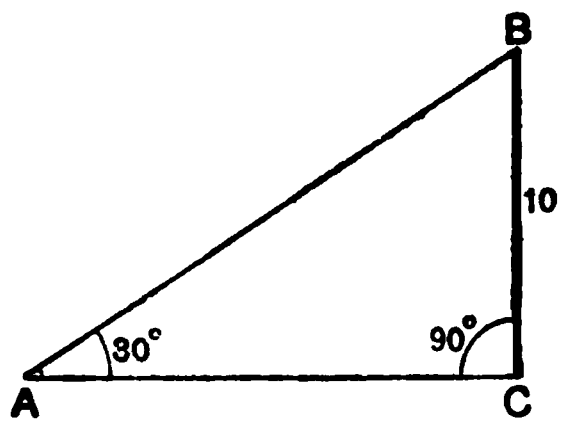
$$\frac{b}{a} = \cot A = \cot 30° = \sqrt{3};$$

$$\therefore \quad b = a\sqrt{3} = 10 \times 1{\cdot}7320 \ldots$$

$$= \underline{17{\cdot}320 \ldots} \text{ (ft.)},$$

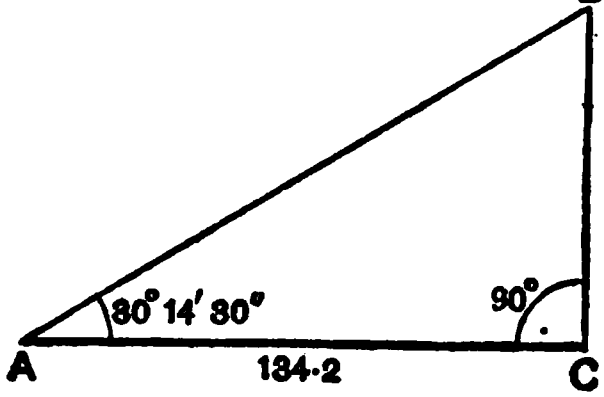
$$\frac{c}{a} = \operatorname{cosec} 30° = 2;$$

$$\therefore \quad c = 10 \times 2 = \underline{20} \text{ (ft.)};$$



$$\therefore \quad B = 60°, \ AC = 17{\cdot}320 \ldots \text{ ft.}, \ AB = 20 \text{ ft.}$$

Example 2. *In a right-angled triangle, in which C is the right angle, A is* 30° 14′ 30″ *and AC is* 134·2 ft. ; *solve the triangle, it being given* that* tan 30° 14′ 30″ = ·5831.



Here $B = 90° - 30°\ 14'\ 30'' = \underline{59°\ 45'\ 30''}$

$$\frac{a}{b} = \tan A = \tan 30°\ 14'\ 30'' = {\cdot}5831;$$

$$\therefore \quad a = b \times {\cdot}5831 = 134{\cdot}2 \times {\cdot}5831 \ldots = \underline{78{\cdot}25 \ldots}$$

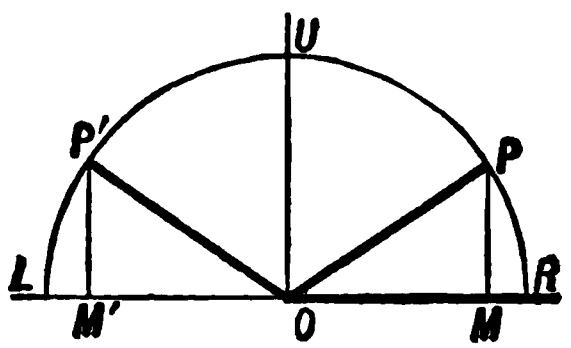
$$c = \sqrt{(a^2 + b^2)} = \sqrt{\{(78{\cdot}25)^2 + (134{\cdot}2)^2\}} = \sqrt{(6123{\cdot}0625 + 18009{\cdot}64)} = \underline{155{\cdot}3\ldots}$$

Hence $B = 59°\ 45'\ 30''$; $BC = 78{\cdot}25\ldots$ ft. ; $AB = 155{\cdot}3$ ft.

* In practice a book of Mathematical Tables is used, from which (as from a Dictionary) the numerical value of the ratio of any given angle can be found, or from which the size of the angle having a given ratio can be found. In Examination Papers if a book of Tables is not supplied, the necessary quotations are given from the Tables (as in the Example above).

67. To trace the changes in sin A *as* **A** *increases from* 0° *to* 180°.

Let a revolving line OP, of constant length (r), turning about O, make with OR the angle ROP (A), so that the angle ROP increases continuously from 0° to 180°.



Draw PM perpendicular to OR or RO produced.

$$\sin A = \frac{MP}{OP} = \frac{MP}{r}.$$

Then as ROP increases **from 0° to 90°,**

MP increases continuously from 0 to r;

$\therefore$ $\sin A$ increases continuously from 0 to 1;

and as ROP increases **from 90° to 180°,**

MP decreases continuously from r to 0;

$\therefore$ $\sin A$ decreases continuously from 1 to 0.

68. To trace the changes in *the sign and magnitude of* **cos A** *as* **A** *changes from* 0° *to* 180°.

Let a revolving line OP, of constant length (r), turning about O, make with OR the angle ROP (A), so that the angle ROP increases continuously from 0° to 180°.

Draw PM perpendicular to OR or RO produced.

$$\cos A = \frac{OM}{OP} = \frac{OM}{r}.$$

Then as the angle ROP increases **from 0° to 90°,**

OM decreases continuously from r to 0;

$\therefore$ $\cos A$ decreases continuously from 1 to 0;

and as ROP increases **from 90° to 180°,** OM' is drawn in the *opposite direction*, and its measure, which is therefore negative, changes continuously from 0 to $-r$;

$\therefore$ $\cos\theta$ decreases continuously from 1 to 0;

$\therefore$ $\cos\theta$ is negative, and changes continuously from 0 to -1.

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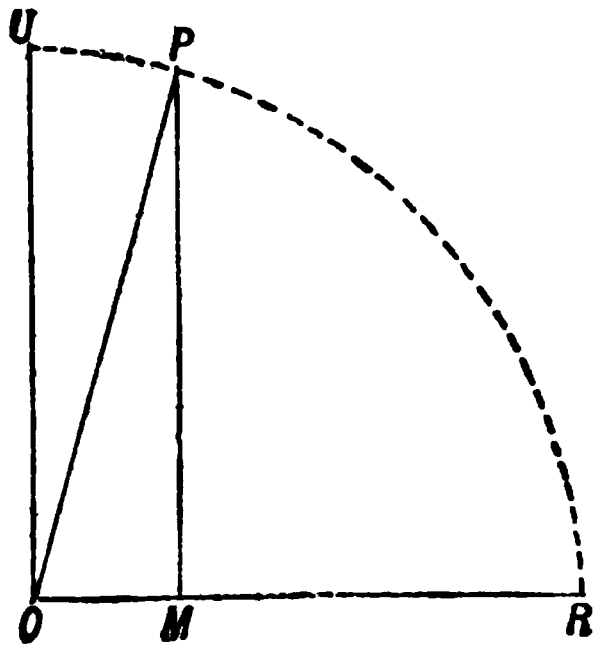
56. *To find* $\sin 90^0$, $\cos 90^0$, $\tan 90^0$.



Let ROP be an angle nearly equal to 90^0, let OP be kept of a constant length, so that as ROP approaches 90^0, P lies on a circle centre O. Draw PM perpendicular to OR.

Consider what happens as the angle ROP *approaches* and *finally becomes* 90^0.

We notice that

(i) MP increases and tends to become equal to OP; and finally becomes equal to OP.

(ii) OM diminishes and tends to become zero, or 0; and finally becomes 0.

(iii) OP is unchanged.

Therefore as the angle ROP *approaches and finally becomes* 90^0,

$$\sin ROP, \text{ i.e. } \frac{MP}{OP}, \text{ approaches } \frac{OP}{OP}; \text{ that is, } 1;$$

and finally becomes 1;

$$\therefore \sin 90^0 = 1.$$

$$\cos ROP, \text{ i.e. } \frac{OM}{OP}, \text{ approaches } \frac{O}{OP}; \text{ that is, } 0;$$

and finally becomes 0;

$$\therefore \cos 90^0 = 0.$$

$$\tan ROP, \text{ i.e. } \frac{MP}{OM}, \text{ approaches } \frac{OP}{O},$$

a fraction which is greater than any assignable number; that is, 'infinity' or ∞;

$$\therefore \tan 90^0 = \infty.$$

88. We proceed to show that the Trigonometrical Ratios of an angle vary in **Sign** according to the **Quadrant** in which the revolving line of the angle happens to be.

From the definition we have, with the usual letters,

$$\sin ROP = \frac{MP}{OP}, \cos ROP = \frac{OM}{OP}, \tan ROP = \frac{MP}{OM}.$$

Fig. I.

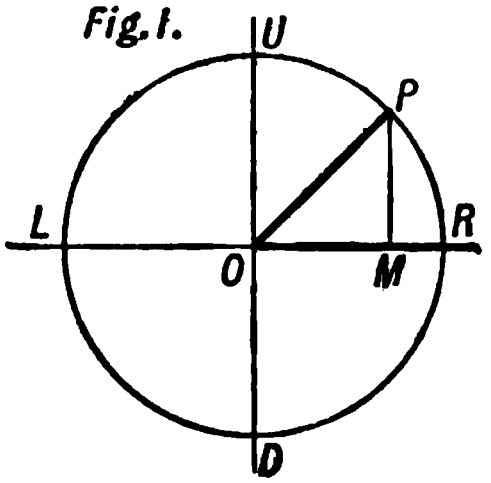


Fig. II.

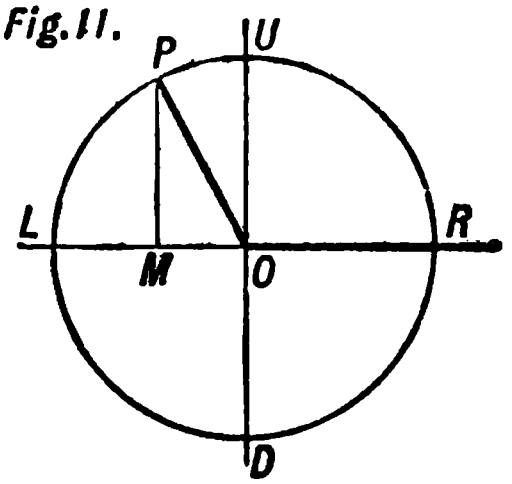


Fig. III.

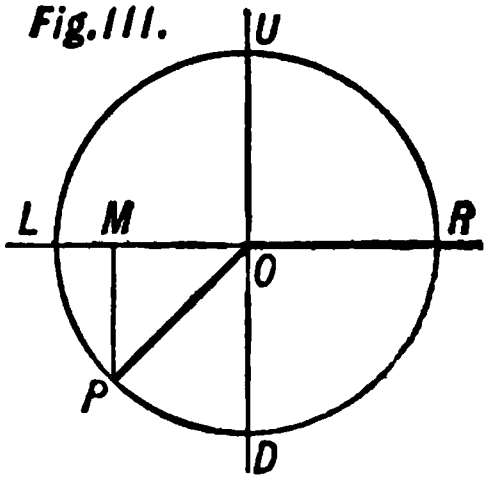
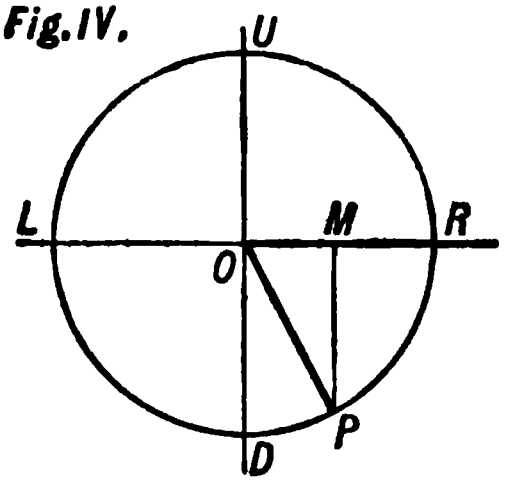


Fig. IV.



I. When OP is in the **first** Quadrant (Fig. I.).

MP is *positive* because from M to P is *upwards* (Rule II. p. 55.)

OM is *positive* because from O to M is *towards the right*, (Rule I.).

OP is *positive*. (Rule III.).

Hence, if A be any angle of the *first* Quadrant,

$\sin A$, which is $\frac{MP}{OP}$, is *positive;*

$\cos A$, which is $\frac{OM}{OP}$, is *positive;*

$\tan A$, which is $\frac{MP}{OM}$, is *positive.*

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ON

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241. Let s stand for half the sum of a, b, c, so that $(a+b+c)=2s$.

Then, $(b+c-a)=(b+c+a-2a)=(2s-2a)=2(s-a)$,
and $(c+a-b)=(c+a+b-2b)=(2s-2b)=2(s-b)$,
and $(a+b-c)=(a+b+c-2c)=(2s-2c)=2(s-c)$.

242. VI. *To prove that* $\sin\frac{A}{2}=\sqrt{\frac{(s-b)(s-c)}{bc}}$,

and that $\cos\frac{A}{2}=\sqrt{\frac{s(s-a)}{bc}}$,

when s *stands for half the sum of the sides* a, b, c.

Now, since $\cos A=\frac{b^2+c^2-a^2}{2bc}$, and $2\sin^2\frac{A}{2}=1-\cos A$;

$$\therefore\ 2\sin^2\frac{A}{2}=1-\cos A=1-\frac{b^2+c^2-a^2}{2bc}\ \text{[Arts. 240, 166]}$$

$$=\frac{2bc-(b^2+c^2-a^2)}{2bc}=\frac{a^2-(b^2-2bc+c^2)}{2bc}$$

$$=\frac{a^2-(b-c)^2}{2bc}=\frac{\{a-(b-c)\}\{a+(b-c)\}}{2bc}.$$

$$\therefore\ \sin^2\frac{A}{2}=\frac{(a+c-b)(a+b-c)}{4bc}.$$

$$\therefore\ \sin\frac{A}{2}=\sqrt{\frac{(2s-2b)(2s-2c)}{4bc}}=\sqrt{\frac{(s-b)(s-c)}{bc}}.$$

Again, since $\cos A=2\cos^2\frac{A}{2}-1$; [Art. 166]

$$\therefore\ 2\cos^2\frac{A}{2}=1+\cos A=1+\frac{b^2+c^2-a^2}{2bc}.$$

$$\therefore\ \cos^2\frac{A}{2}=\frac{(b+c)^2-a^2}{4bc}=\frac{(b+c+a)(b+c-a)}{4bc}.$$

$$\therefore\ \cos\frac{A}{2}=\sqrt{\frac{2s\,.\,(2s-2a)}{4bc}}=\sqrt{\frac{s\,.\,(s-a)}{bc}}.$$

274. ***To find the Radius of the*** **Circumscribing Circle.**

Fig. I.

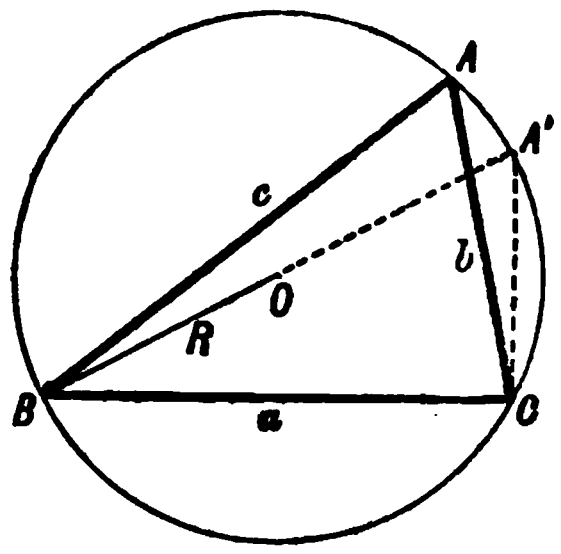
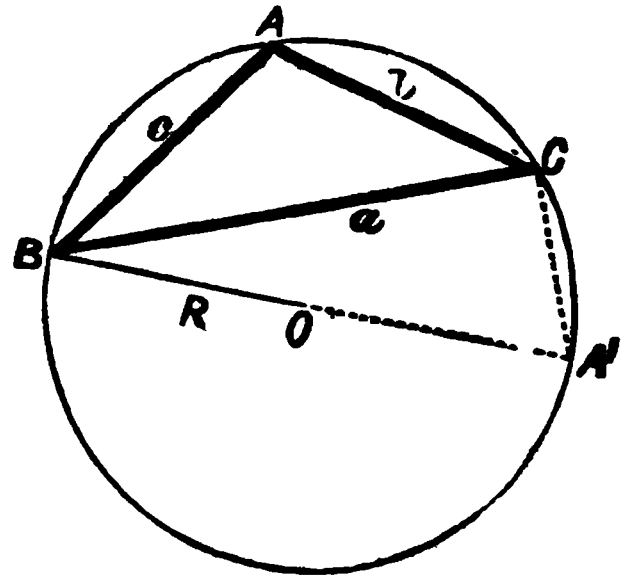


Fig. II.



Let a circle $AA'CB$ be described about the triangle ABC. Let R stand for its radius. Let O be its centre. Join BO, and produce it to cut the circumference in A'. Join $A'C$.

Then, Fig. I. the angles BAC, $BA'C$ in the same segment are equal; Fig. II. the angles BAC, $BA'C$ are supplementary; also the angle BCA' in a semicircle is a right angle.

$$\text{Therefore } \frac{CB}{A'B} = \sin CA'B = \sin CAB = \sin A,$$

$$\text{or, } \frac{a}{2R} = \sin A;$$

$$\therefore 2R = \frac{a}{\sin A}.$$

275. Similarly, it may be proved that

$$2R = \frac{b}{\sin B}; \text{ and that } 2R = \frac{c}{\sin C}.$$

$$\text{Hence, } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R.$$

Thus d, the value of each of these fractions, is the diameter of the circumscribing circle.

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AND

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[SPECIMEN PAGE]

Easy Trigonometrical Equations.

40. As a further exercise in using the formulæ of Art. 29 and the numerical values of the functions of 45°, 60°, 30°. we shall now give some examples in trigonometrical equation.

Example 1. Solve $4\cos A = 3\sec A$.

By expressing the secant in terms of the cosine, we have

$$4\cos A = \frac{3}{\cos A},$$

$$4\cos^2 A = 3,$$

$$\cos A = \pm\frac{\sqrt{3}}{2}.$$

$$\therefore \cos A = \frac{\sqrt{3}}{2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1),$$

or

$$\cos A = -\frac{\sqrt{3}}{2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2).$$

Since $\cos 30° = \frac{\sqrt{3}}{2}$, we see from (1) that $A = 30°$.

The student will be able to understand the meaning of the negative result in (2) after he has read Chap. VIII.

Example 2. Solve $3\sec^2\theta = 8\tan\theta - 2$.

Since $$\sec^2\theta = 1 + \tan^2\theta,$$

we have $$3(1 + \tan^2\theta) = 8\tan\theta - 2,$$

or $$3\tan^2\theta - 8\tan\theta + 5 = 0.$$

This is a quadratic equation in which $\tan\theta$ is the unknown quantity, and it may be solved by any of the rules for solving quadratic equations.

Thus $$(\tan\theta - 1)(3\tan\theta - 5) = 0,$$

therefore *either* $$\tan\theta - 1 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (1),$$

or $$3\tan\theta - 5 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2).$$

From (1), $\tan\theta = 1$, so that $\theta = 45°$.

From (2), $\tan\theta = \frac{5}{3}$, a result which we cannot interpret at present.

41. When an equation involves more than two functions, it will usually be best to express each function in terms of the sine and cosine.

[SPECIMEN PAGE]

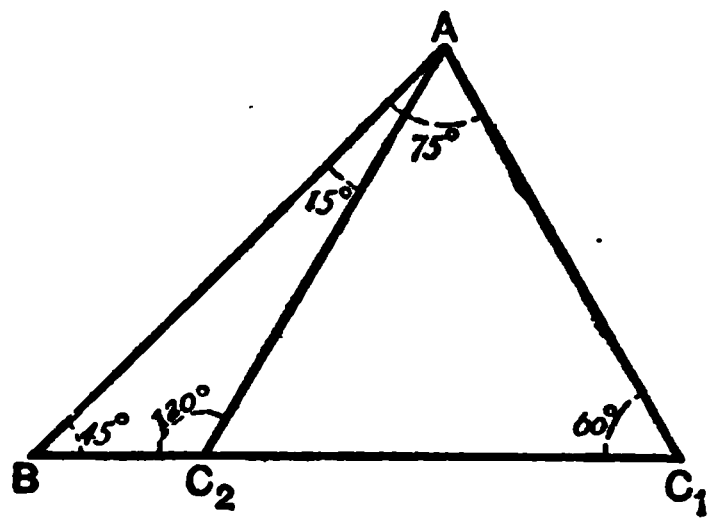
Example. Given $B=45°$, $c=\sqrt{12}$, $b=\sqrt{8}$, solve the triangle.

We have $$\sin C=\frac{c\sin B}{b}=\frac{2\sqrt{3}}{2\sqrt{2}}\cdot\frac{1}{\sqrt{2}}=\frac{\sqrt{3}}{2}.$$

$$\therefore\ C=60°\text{ or }120°,$$

and since $b<c$, both these values are admissible. The two triangles which satisfy the data are shewn in the figure.

Denote the sides BC_1, BC_2 by a_1, a_2, and the angles BAC_1, BAC_2 by A_1, A_2 respectively.



(i) In the $\triangle ABC_1$, $\angle A_1=75°$;

hence $$a_1=\frac{b\sin A_1}{\sin B}=\frac{2\sqrt{2}}{\frac{1}{\sqrt{2}}}\cdot\frac{\sqrt{3}+1}{2\sqrt{2}}=\sqrt{2}(\sqrt{3}+1).$$

(ii) In the $\triangle ABC_2$, $\angle A_2=15°$;

hence $$a_2=\frac{b\sin A_2}{\sin B}=\frac{2\sqrt{2}}{\frac{1}{\sqrt{2}}}\cdot\frac{\sqrt{3}-1}{2\sqrt{2}}=\sqrt{2}(\sqrt{3}-1)$$

Thus the complete solution is
$$\begin{cases} C=60°, \text{ or } 120°; \\ A=75°, \text{ or } 15°; \\ a=\sqrt{6}+\sqrt{2}, \text{ or } \sqrt{6}-\sqrt{2}. \end{cases}$$

EXAMPLES. XIII. b.

1. Given $a=1$, $b=\sqrt{3}$, $A=30°$, solve the triangle.
2. Given $b=3\sqrt{2}$, $c=2\sqrt{3}$, $C=45°$, solve the triangle.
3. If $C=60°$, $a=2$, $c=\sqrt{6}$, solve the triangle.

[SPECIMEN PAGE]

If a be the smallest positive angle which has the given tangent, then $A = n\pi + a$, and we are really finding the value of

$$\tan \frac{1}{2}(n\pi + a).$$

(1) Let n be even and equal to $2m$; then

$$\tan \frac{1}{2}(n\pi + a) = \tan\left(m\pi + \frac{a}{2}\right) = \tan \frac{a}{2}.$$

(2) Let n be odd and equal to $2m+1$; then

$$\tan \frac{1}{2}(n\pi + a) = \tan\left(m\pi + \frac{\pi}{2} + \frac{a}{2}\right) = \tan\left(\frac{\pi}{2} + \frac{a}{2}\right).$$

Thus $\tan \frac{A}{2}$ has the two values $\tan \frac{a}{2}$ and $\tan\left(\frac{\pi}{2} + \frac{a}{2}\right)$.

Example 1. If $A = 170°$, prove that $\tan \frac{A}{2} = \frac{-1 - \sqrt{1 + \tan^2 A}}{\tan A}$.

Here $\frac{A}{2}$ is an acute angle, so that $\tan \frac{A}{2}$ must be positive. Hence in the formula $\frac{-1 \pm \sqrt{1 + \tan^2 A}}{\tan A}$ the numerator must have the same sign as the denominator. But when $A = 170°$, $\tan A$ is negative, and therefore we must choose the sign which will make the numerator negative; thus $\tan \frac{A}{2} = \frac{-1 - \sqrt{1 + \tan^2 A}}{\tan A}$.

Example 2. Given $\cos A = \cdot 6$, find $\tan \frac{A}{2}$, and explain the double answer.

$$\tan^2 \frac{A}{2} = \frac{1 - \cos A}{1 + \cos A} = \frac{\cdot 4}{1 \cdot 6} = \frac{1}{4};$$

$$\therefore \tan \frac{A}{2} = \pm \frac{1}{2}.$$

Here all we know of the angle A is that it must be one of a group of equi-cosinal angles. Let a be the smallest positive angle of this group; then $A = 2n\pi \pm a$.

$$\therefore \tan \frac{A}{2} = \tan\left(n\pi \pm \frac{a}{2}\right) = \tan\left(\pm \frac{a}{2}\right) = \pm \tan \frac{a}{2}.$$

Thus we have two values differing only in sign.

[SPECIMEN PAGE]

299. By means of the identities

$$2\sin^2 a = 1-\cos 2a, \qquad 2\cos^2 a = 1+\cos 2a,$$

$$4\sin^3 a = 3\sin a - \sin 3a, \qquad 4\cos^3 a = 3\cos a + \cos 3a,$$

we can find the sum of the squares and cubes of the sines and cosines of a series of angles in arithmetical progression.

Example 1. Find the sum of n terms of the series

$$\sin^2 a + \sin^2(a+\beta) + \sin^2(a+2\beta) + \ldots\ldots.$$

$$2S = \{1-\cos 2a\} + \{1-\cos(2a+2\beta)\} + \{1-\cos(2a+4\beta)\} + \ldots\ldots$$

$$= n - \{\cos 2a + \cos(2a+2\beta) + \cos(2a+4\beta) + \ldots\ldots\};$$

$$= n - \frac{\sin n\beta}{\sin\beta}\cos\frac{2a+\{2a+(n-1)2\beta\}}{2};$$

$$\therefore\ S = \frac{n}{2} - \frac{\sin n\beta}{2\sin\beta}\cos\{2a+(n-1)\beta\}.$$

Example 2. Find the sum of the series

$$\cos^2 a + \cos^2 3a + \cos^2 5a + \ldots\ldots + \cos^2(2n-1)a.$$

$$4S = (3\cos a + \cos 3a) + (3\cos 3a + \cos 9a) + (3\cos 5a + \cos 15a) + \ldots\ldots$$

$$= 3(\cos a + \cos 3a + \cos 5a + \ldots\ldots) + (\cos 3a + \cos 9a + \cos 15a + \ldots\ldots)$$

$$= \frac{3\sin na}{\sin a}\cos\left\{\frac{a+(2n-1)a}{2}\right\} + \frac{\sin 3na}{\sin 3a}\cos\left\{\frac{3a+(2n-1)3a}{2}\right\};$$

$$\therefore\ S = \frac{3\sin na\cos na}{4\sin a} + \frac{\sin 3na\cos 3na}{4\sin 3a}.$$

300. The following further examples illustrate the principle of Art. 293.

Example 1. Find the sum of the series

$$\tan^{-1}\frac{x}{1+1.2.x^2} + \tan^{-1}\frac{x}{1+2.3.x^2} + \ldots\ldots + \tan^{-1}\frac{x}{1+n(n+1)x^2}.$$

As in Art. 249, we have

$$\tan^{-1}\frac{x}{1+r(r+1)x^2} = \tan^{-1}(r+1)x - \tan^{-1}rx;$$

$$\therefore\ S = \tan^{-1}(n+1)x - \tan^{-1}x.$$

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The Kinematical Section is fuller than has hitherto been usual in books of this class; the treatment of independent velocities occupies more space, that of acceleration is carried further, and such problems as Simple Harmonic Motion occur in their logical place.

Mass is discussed from the point of view of inverse acceleration—ratios. Newton's formulation of the Laws of Motion is, as far as possible, retained: but an attempt is made, following modern authorities, to interpret the Laws so as to keep in view the Relativity of Motion. An entire chapter is devoted to Work and Energy.

The Velocity diagram and the Hodograph are constantly employed; for example, the former is often of use in discussing the Impact of Particles, and the latter in discussing the Motion of Projectiles.

If now we choose a certain particle A as being of unit mass, a particle B whose mass is m is such that

$$-\frac{\text{magnitude of acceleration of } A \text{ due to } B}{\text{magnitude of acceleration of } B \text{ due to } A} = \frac{m}{1}.$$

Thus the mass-ratio of the particle B to the unit particle A is a number m, which we may call the mass of B.

Similarly, in the case of another particle C, the mass-ratio of C to A is a number m', which we may call the mass of C.

If now the particles B, C be tested by experiment, we find, as previously remarked, that their mass-ratio is a constant number.

Moreover, a comparison of experimental results shows that this number is equal to $\frac{m}{m'}$.

The same is, of course, true of any other particles.

Thus there is associated with each particle a certain number called its *mass*, such that the ratio of the masses of any two particles is equal to their mass-ratio as above defined.

When two or more particles are rigidly connected so as to form a single particle, the mass of the single particle is found to be equal to the arithmetic sum of the masses of the separate particles composing it. For instance, the mass of a leaden bullet A, formed by melting together two other leaden bullets B and C, is the sum of the masses of B and C.

Two homogeneous particles of the same material and volume are found to have equal masses. Hence the masses of homogeneous particles of the same material are proportional to their volumes, a result in accordance with observed facts.

The mass of a particle, as is seen from the above discussion, is a constant scalar quantity. The *constancy* of mass has usually been assumed owing to Newton's definition of it.

Units of Mass. The British unit of mass, *i.e.* the body regarded as a particle whose mass is arbitrarily assumed to be unity, is a lump of platinum kept at Westminster, and called the Imperial Standard Pound.

The C.G.S. unit of mass is $\frac{1}{1000}$ part of the mass of a lump of platiniridium kept at Paris, and called the International Prototype Kilogram. This unit is called a Gram.

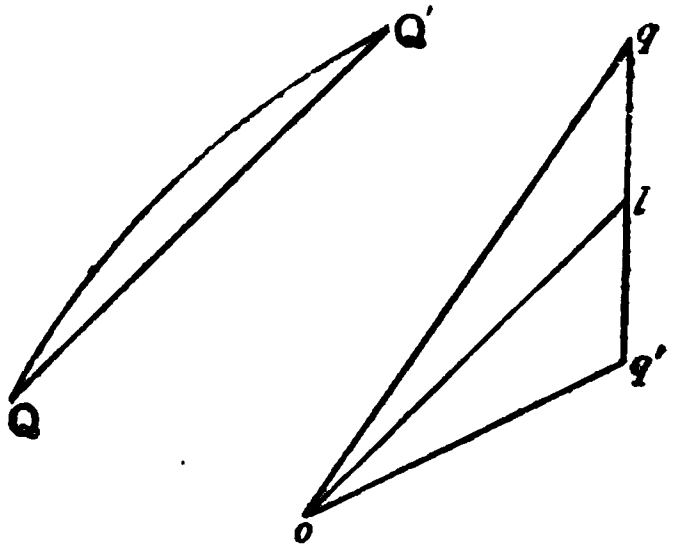
The Kilogram was designed to represent, and approximately does so, the mass of 1000 cubic centimetres of distilled water at 4° C. and 760 millimetres barometric pressure.

Our definition of mass is now complete as far as Galileo's axes are concerned; we shall presently extend it.

[SPECIMEN PAGE]

As we shall give an independent proof of these important properties in the next article, we leave the above deductions as an exercise to the student.

157. *To find from the hodograph the range of a projectile on a given inclined plane through the point of projection at right angles to the vertical plane of the path, and to discuss the circumstances of projection.*



(1) **Range.** Let QQ' be the range on the inclined plane, qq' the hodograph for the portion of the path QQ', o the pole of the hodograph, l the middle point of qq', t the time from Q to Q'.

Then (§ 40, ii., Cor.) ol is the average velocity from Q to Q'.

Therefore the range $= QQ' = ol \,.\, t$.

But $ql = lq' = \frac{gt}{2}$, and therefore $t = \frac{2ql}{g}$.

Hence the range $= 2 \,.\, \frac{ol \,.\, lq}{g} = \frac{2uv}{g}$, *where* u, v *are the magnitudes of the (oblique) components of the initial velocity parallel to the plane and the vertical.*

This form of the expression for the range, which is convenient to remember, may be at once reduced to that of the last article.

We have, in fact, $oq = V$, $ol = u$, $lq = v$, angle $qol = a - i$, angle $oql = \frac{\pi}{2} - a$, angle $olq = \frac{\pi}{2} + i$.

$\therefore$ by trigonometry,

$$u = \frac{V \cos a}{\cos i}, \quad v = \frac{V \sin(a - i)}{\cos i},$$

and

$$\frac{2uv}{g} = \frac{2V^2}{g} \cdot \frac{\cos a \sin(a - i)}{\cos^2 i}.$$

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21. Find in magnitude and direction the least force which will keep a body weighing 100 lbs. at rest on a smooth inclined plane, inclined at an angle of 45° to the horizontal. (*N.B.*—A graphical solution will be accepted.) (Science and Art, 1898.)

Summary.

A **machine** is an arrangement for transmitting force. The magnitude of the force is generally altered in the process.

The force applied to a machine is called the **Effort** (sometimes called Power, but this is not a good term for it); the force overcome is called the **Resistance.**

$$\textbf{Mechanical advantage} = \frac{\textbf{Resistance}}{\textbf{Effort}}.$$

In any practical case the work done by the effort exceeds that done against the resistance, because some work is lost in overcoming friction, etc., in the parts of the machine.

In a machine

$$\textbf{Efficiency} = \frac{\textbf{Work obtained}}{\textbf{Work expended}}.$$

If a and b are infinitesimally small distances through which the effort acts, and the resistance is overcome at the same time in any machine, then

$$\textbf{Velocity ratio} = \frac{a}{b}.$$

$$\textbf{Mechanical advantage} = \textbf{Velocity ratio} \times \textbf{Efficiency}.$$

Levers.—The general necessary and sufficient condition of equilibrium is that the moments about the fulcrum of the effort and the resistance should be equal and opposite.

Levers are divided into three classes according as *Fulcrum*, *Resistance*, or *Effort* is in the middle.

In any simple machine, if there is no friction, the work done by the effort may be shown to be equal to that done against the resistance. Or, assuming this principle, we can find the relation between the effort and the resistance.

With a **smooth inclined plane** suppose **P** is the effort necessary to sustain a body of weight **W** on the face of the plane, and **R** is the normal resistance of the plane. Let the height, length, and base be h, l, b.

(a) If **P** is parallel to the face of the plane,

$$\frac{\mathbf{P}}{h} = \frac{\mathbf{W}}{l} = \frac{\mathbf{R}}{b}.$$

(b) If **P** is horizontal,

$$\frac{\mathbf{P}}{h} = \frac{\mathbf{W}}{b} = \frac{\mathbf{R}}{l}.$$

[SPECIMEN PAGE]

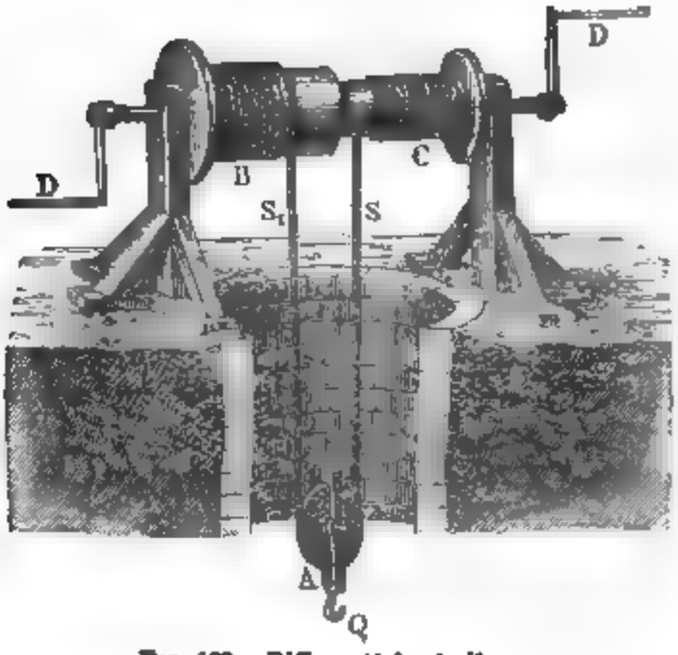

FIG. 133.—Differential windlass.

Suppose an effort **P** applied to the handle to sustain a weight **W**. Then the tension in the rope is $\frac{W}{2}$. And by moments about the axis of the drum,

$$Pa = \frac{W}{2}(b - c);$$

$$\frac{W}{P} = \frac{2a}{b - c}.$$

EXPERIMENT 35.—A wheel-and-axle is easily made by attaching a disc of wood to a cylinder of much smaller radius, or else by turning the whole in one solid piece. The first plan is simpler. A wheel of about 8 inches diameter and an axle of 1 inch diameter and 3 inches long will do very well. The wheel should be screwed firmly on the end of the axle with three or four screws, none of which passes through the centre. Two wire nails or screws may then be fixed at the centre of the wheel and at the other end of the axle to form an axis of rotation, and the arrangement set so that it can turn on two upright supports.

Fasten strings to the wheel and the axle, and wind them round in opposite ways.

First find the velocity ratio by finding how far the wheel string must be pulled down to raise a point of the axle string by a certain amount, say 2 or 3 inches.

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iron, oak, pine, and cork, one after another, into the water. Observe that (1) some sink and others float, (2) of those which float some sink further into the water than others. Take the objects which sink in water and place them in mercury. Notice that they float.

Partly fill a glass cylinder, divided into cubic centimetres, and record the level of the water therein. Drop in one of the cubic centimetre solids which sinks, and again read the level of the water; put the others in in order, recording the level of the water after each such addition. It will be found that the level increases by 1 cubic centimetre division in each case.

Take any solid, such as a glass stopper or a marble, and drop it gently into water contained in the graduated glass cylinder. Read the level of the water before and after dropping the solid in; the difference between these readings will give you the volume of the solid in cubic centimetres.

READING LESSON.

Some Things sink, others float in Water.—When you throw a stone into water what happens to it? It sinks to the bottom. But if you throw a piece of wood into water does it also sink? No, it floats. By noticing what happens when different substances are put in water you can easily divide them into two classes. Those in one division all sink, while those in the other all float. And, of those that float, some sink further into the water than others.

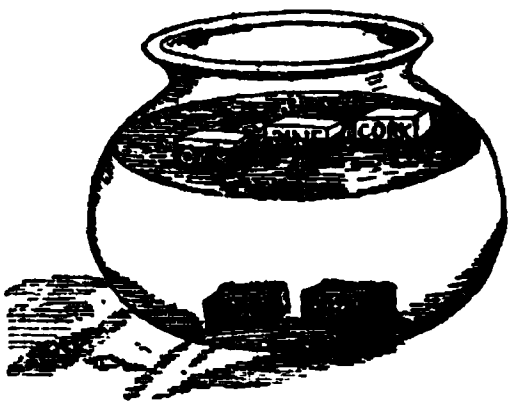

FIG. 37.—Some things sink, and others float, in water.

But you must not suppose that substances which sink in water will sink in every liquid. As a matter of fact, solid iron, or even lead, will float upon mercury.

Volume of Water displaced by Bodies placed into it.—If we put water into a narrow glass cylinder, and then add lumps of material of such a size and shape that they will go into

Another way is to burn a little phosphorus in a sealed tube having a pointed end, and then by breaking off the end of the tube under water, the volume of water which takes the place of the air used can be found, and its proportion to the whole volume of the tube can be determined.

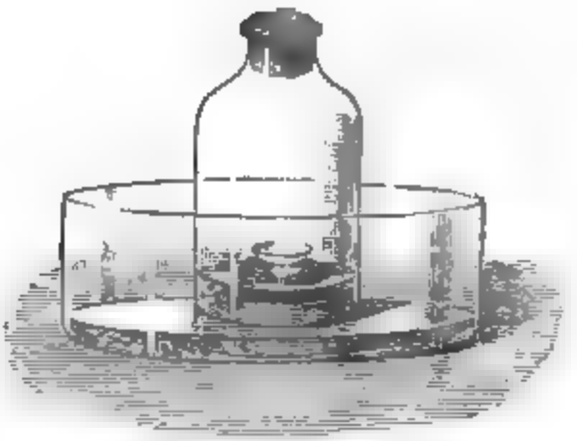

FIG. 58.—Phosphorus uses up one-fifth of the air in the bottle when it burns, and water rises to take the place of the air used.

That the gas left behind is really the inactive part, which is called nitrogen, can be proved by quickly pulling out the stopper of a jar in which phosphorus has been burnt, and introducing a lighted taper. The flame is at once extinguished.

Phosphorus slowly takes out the active part of the air without being lighted.—We have seen that iron slowly takes the active part of the air and combines with it to form rust. And this happens without heating the iron. Will ordinary phosphorus do the same when it is not alight? This question, too, is easily answered by a simple experiment. When a piece of clean phosphorus is exposed to an enclosed quantity of air over water, the rapid changes described in the last paragraph take place slowly. The only difference in the two cases is the rate at which the active part of the air is taken out. Burning phosphorus combines with the active part very quickly; ordinary phosphorus but slowly. Still, given time enough, ordinary phosphorus will remove all the active part of air, and at the end of the experiment it will be found that again one-fifth of the air has disappeared.

TO BE REMEMBERED.

Phosphorus readily burns in the air; in doing so it takes out the active part and combines with it to form a white snow-like powder.

Phosphorus can also, like iron, slowly take out the active part of the air without being lighted.

When phosphorus is burnt in an enclosed volume of air, one-fifth of the volume is used up, and four-fifths remain.

5. When would you expect a man to breathe out most carbonic acid gas, when sitting still or when working hard, and why?

6. Clear lime-water is left in an unstoppered bottle, what happens and why?

7. Why is it dangerous to descend into an old well or mine which has not been ventilated?

LESSON XVI.

CARBON DIOXIDE IN THE AIR.

PRACTICAL WORK.

Things required.—Spring water or water saturated with carbonic acid gas. Fresh watercress. Test-tubes. Basin of water. Splinters. Glass jar. Large funnel. Green leaves. Piece of sheet iron or tin plate.

What to do.

Carbon dioxide in water.—Procure some fresh spring water, which generally contains carbon dioxide dissolved in it. You can see whether the water you think of using contains carbon dioxide by adding lime-water. If there is no milkiness the water is unsuitable for the experiment. In that case you must pass carbon dioxide into some water for a little while from the delivery tube of an apparatus like that in Lesson XIII.

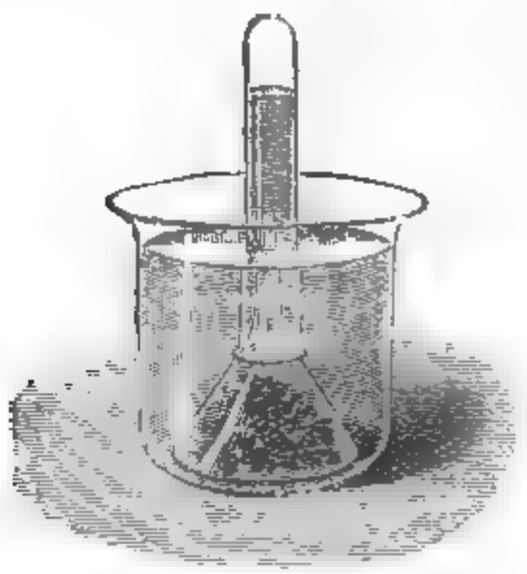

FIG. 41.—Oxygen is given off from fresh watercress in bright sunlight.

Oxygen from plants.—Take a bunch of fresh watercress, or water weeds, and put it into a beaker or glass jar and completely fill it with the water saturated with carbon dioxide. Cover the plants with a funnel nearly as wide as the jar,

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(2) The limitation of the text to instructions for the intelligent performance of the experiments, and the recognition of the significance of the results obtained.

(3) The number of new and simple experimental devices which, by the courtesy of various teachers, it has been possible to incorporate.

(4) The numerous illustrations showing at a glance the apparatus required and the method of procedure.

Teachers of practical physics, whether in "Schools of Science," or other schools in which experimental work in physical science forms a part of the curriculum, may be left to judge for themselves as to the value of these points. Our own experience in teaching and examining has convinced us that a sound knowledge of any scientific principle is only obtained after many experiments designed to present it under different aspects have been performed and studied. It is for this reason that several exercises are given under each division of the subject. When time permits a student ought to perform practically all the exercises, in order to impress upon his mind the principles they exemplify; he should, in fact, regard the exercises as he does the examples in his mathematical books, and work as many of them as he can. But where certain subjects must be studied in the very few hours per week allotted to practical physics it will be necessary for the teacher to make a selection.

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[SPECIMEN PAGE]

(*a*) If the area of each small square of the base of a block like *A* in Fig. 48 is 1 sq. cm., and the slabs are 1 cm. thick, how many cubic centimetres are there in a single slab of the block? How many cubic centimetres are there in three of the slabs? How many cubic centimetres are there in the whole of the slabs?

Now examine a block like *B*, Fig. 48, and determine (1) the area of the base, (2) the number of cubic centimetres in a single slab, (3) the number of cubic centimetres in the whole of the slabs, that is, the volume of the triangular prism.

Proceed in the same way to determine the volumes of blocks like *C* and *D* in Fig. 48. The area of the base of *D* can be found by placing the block upon squared paper and drawing a line around it.

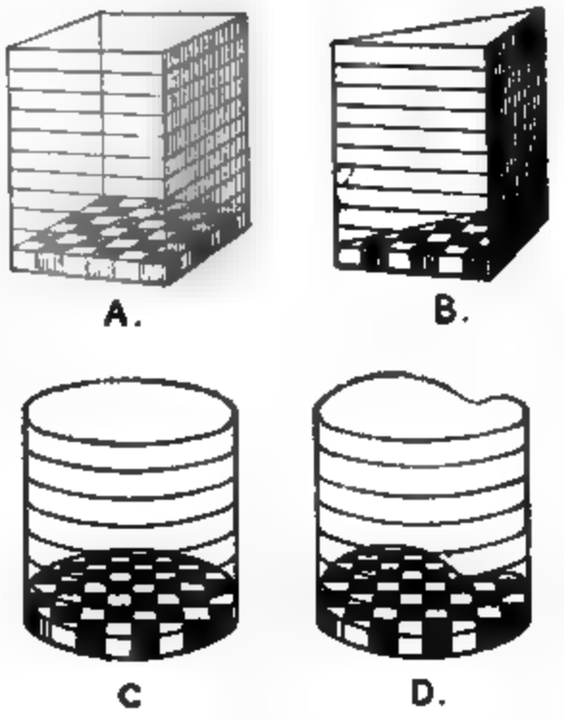

FIG. 48.—Determination of volumes of solids.

(*b*) Measure in centimetres the length, breadth, and height of a rectangular block, and by multiplying the three numbers together determine the number of cubic centimetres there are in the block.

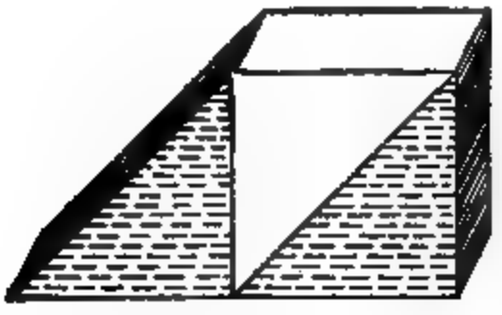

FIG. 49.—A parallelopiped can be converted into a cube.

Parallelopiped.

(*c*) Place together two triangular blocks or prisms to form a cube. Then place the shaded block against the unshaded one so as to form the slant shape shown in Fig. 49.

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[SPECIMEN PAGE]

from a plane mirror, that is, a flat reflecting surface. Such a mirror can be made from a variety of substances, but the most common is bright metal or silvered glass. To find the relation between the angle at which a beam strikes a mirror and the angle at which it is reflected, the following experiment should be performed.

EXPT. 162.—Fix two slabs of wood at right angles as in Fig. 73, AB, CD. Against the upright slab place a piece of

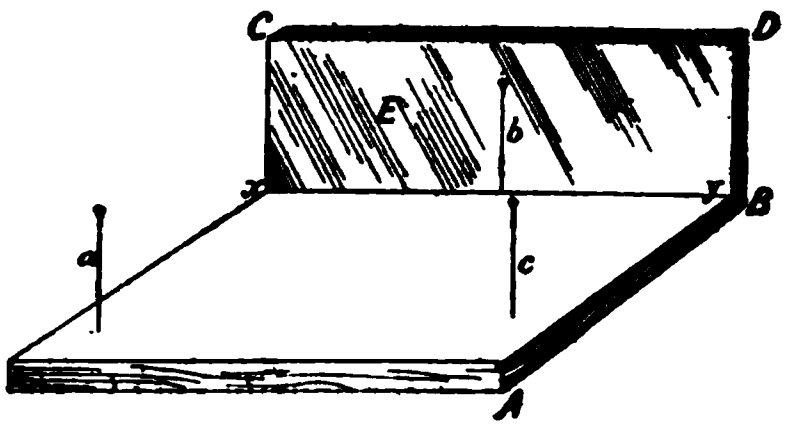

FIG. 73.—Arrangement to illustrate the Law of Reflection.

glass EF with blackened back so that reflection only takes place from the front. Upon the horizontal slab place a sheet of white paper. Stick a pin *b* in the wood against the glass, and place another pin near the position *a*. Now procure another pin and stick it into the wood at *c* in such a position that *c*, *b*, and the image of *a* are in a straight line. Draw with a finely pointed pencil a line along the edge of the glass *xy*; then take glass and pins away.

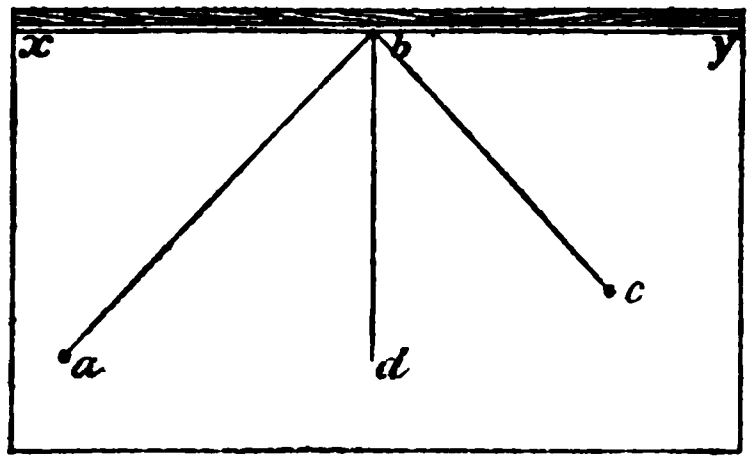

FIG. 74.—Angles of Incidence and Reflection

The paper will be marked by the pin-holes and the line *xy*. Draw lines through the pin-holes, and at *b* a normal to *xy*, that is, a line perpendicular to *xy*. Measure the angles *abd*, *cbd*, and compare them (Fig. 74). Repeat the experiment two or three times, with the pins in different positions, and so determine that the angle of incidence and the angle of reflection are equal.

EXPT. 262.—The flask which contained the copper and sulphuric acid should next be examined. It will be observed that most of the copper has disappeared, and the contents of the flask have a black colour. Add some water, shake well, and filter, when a blue liquid is obtained. Evaporate this partially, and put aside to crystallise. It will be found that blue crystals are so obtained.

These crystals are what are known commercially as *blue vitriol*, the chemical name being *sulphate of copper*. We may therefore state that **Copper and sulphuric acid produce sulphur dioxide and copper sulphate.**

Sulphur Trioxide and Sulphuric Acid.—Although sulphur dioxide does not burn, yet by suitable means we can make it

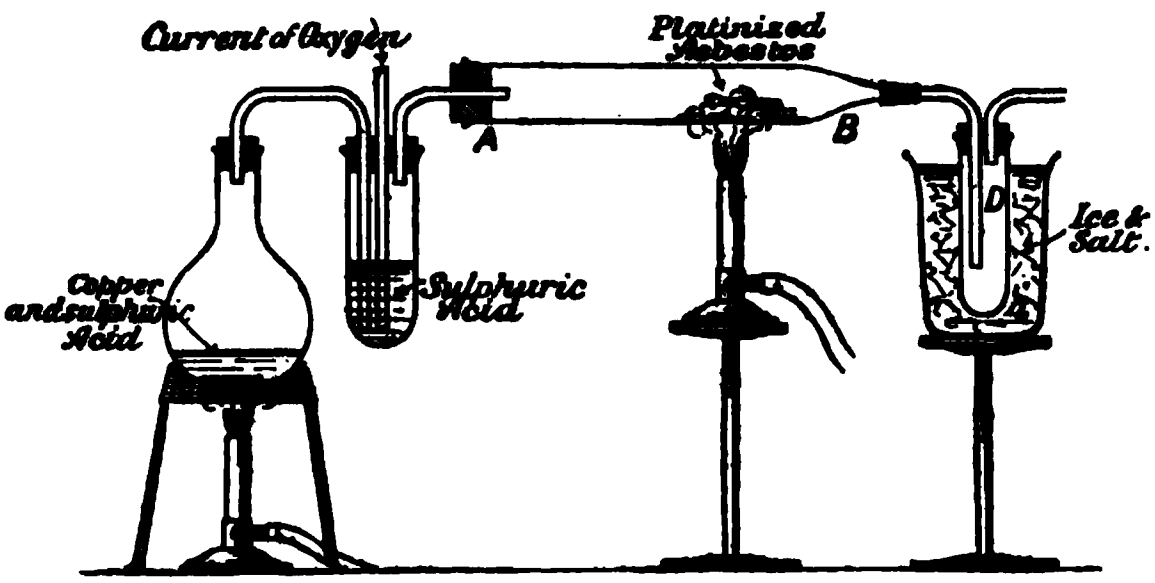

FIG. 129.—Preparation of Sulphur Trioxide.

combine with more oxygen and produce a higher oxide, which is known as **sulphur trioxide.**

EXPT. 263.—In the tube AB place some platinised asbestos,[1] and pass through the tube a well-dried mixture of sulphur dioxide and oxygen or air, the gases then being had into the cooled tube D. Heat the tube of asbestos, and note that white fumes are formed which condense in the cooler flask to form a white powder or crystals.

This powder is sulphur trioxide, and we may now state:— **Sulphur dioxide with oxygen forms sulphur trioxide.**

[1] This is prepared by dipping asbestos fibres into (1) platinic chloride solution, (2) ammonium chloride solution, and heating strongly. By this means the asbestos becomes coated with a quantity of very finely divided platinum.

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TO

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FOR USE IN SCHOOLS

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EXTRACTS FROM PREFACE

THIS introduction to Practical Physics is published in the hope that it will be found of use by those who are engaged in teaching the subject to boys of about thirteen or fourteen years of age and upwards. It is based on the Laboratory notes which have been in use at Clifton for some years past, and the proof-sheets having been used in the Laboratory for some months, have thus received the criticism of those for whom the book has been primarily written. This fact enables the author to feel confident that the book will present no difficulty to the average boy of the age which has been mentioned, and that all the experiments described are capable of being performed with the most simple and inexpensive apparatus.

A word of explanation may be given as to the principles on which the book is based. A somewhat extended experience of teaching experimental Physics to large classes in a Public School has convinced the author that it is possible for a boy to "work through" a course of Practical Physics in such a way as to lose many of the advantages of this kind of study. If the explanations given in the text-book are too detailed, and if the conclusions to be drawn from each experiment are explicitly stated, a boy may perform the experiments, and write out a fairly clear account of them; yet this account may be nothing but a transcript or a paraphrase of the text-book. All incentive to independent thought is here withdrawn, except in the case of boys who are greatly interested in the subject; and instead of a spirit of scientific curiosity being developed it is rather discouraged, since it is to the apparent interest of the pupil to hurry over the ground as fast as possible. The laboratory work becomes, like many other school lessons, a matter of learning certain facts, no doubt of considerable importance, without the mental training being different in kind from that conveyed in other branches of school work.

In the course here described, an attempt is made to induce the pupil to think for himself, and to treat each experiment as a problem which he himself has to solve; while the solution is rendered possible by suggestions given in the form of questions which he has to answer. Thus, after being told what he has to do, the pupil is asked what the result of his experiment has been—what consequences he has seen to result from certain operations. Instead of the conclusions to be drawn from the experiment, or the appropriate chain of reasoning, being explicitly stated, they are indicated by a series of questions which the pupil has to answer. If he cannot answer any of the questions he should go to the teacher, who can generally induce him to answer the question himself by one or two other questions judiciously put, or, what is easier but less instructive, can give the answer at once. So far as the authors' own experience has gone, he is a very dull boy indeed who cannot work through nearly the whole course with the very minimum of

help from the teacher. It may here be noted, that the pupil should be taught to write out his notes in such a way that reference to the book on the part of the teacher is unnecessary. Thus, instead of merely writing the answers to the questions in the text, the questions themselves should either be written down, each followed immediately by its answer, or else the answers should be in such a form that there can be no doubt what the questions were. It is hardly necessary to say that the latter is much the better method.

The course has been arranged in the order in which the subjects are usually taken by boys on the modern side at Clifton ; but it is possible to take them in any order which the teacher may consider most suitable. For some reasons it may be desirable to take Part III. before Part II., but this must depend, to some extent, on the arrangements made for the teaching of Physics in each particular school. It will be noticed that certain experiments are marked with an asterisk. These are experiments which (mainly on account of their difficulty) may with advantage be omitted by younger boys on taking the subject for the first time.

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EXPERIMENT 16

To find the volume of an irregular solid which sinks in water.

If you place the solid in a vessel which is quite full of any liquid, what do you know about the volume of the liquid which runs over, or is displaced? If the liquid is water, what do you know about the mass of the water which is displaced?

Counterpoise in one pan of your balance a dry beaker. Take a test-tube just wide enough to admit the solid (a glass stopper is a very convenient object to use for this experiment). Make a mark with a file on the test-tube, at such a height that when the stopper is in the test-tube it will be completely covered if water is poured in up to the mark.

Fill the test-tube up to the mark with water, carefully adjusting the level by means of a pipette. Then drop the stopper gently into the test-tube by inclining the tube and letting the stopper slide down so that no water splashes out of the test-tube. The water will now be above the mark. Transfer, by means of a pipette, all the water that has risen above the mark to the counterpoised beaker, and then weigh this water.

What is the mass of the water that has been displaced by the stopper?

What is the volume of this water, and therefore of the stopper?

Weigh the stopper.

Knowing the mass and volume of the stopper, calculate its density.

Would your result be equally trustworthy if you used a very wide test-tube? (See p. 14.)

Would you expect an equally accurate result if you filled

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so that the bulb of the thermometer is in the water. Heat the flask by your Bunsen burner and notice the thermometer.

You will observe that the temperature of the water rises steadily for some time and then stops rising.

What is the temperature at which the thermometer stops rising? What do you notice about the water?

Raise the thermometer till the bulb is just above the surface of the water, and note the temperature.

Place about 50 grammes of common salt in the water, and, after it has been dissolved, take the temperature of the boiling water and then of the steam.

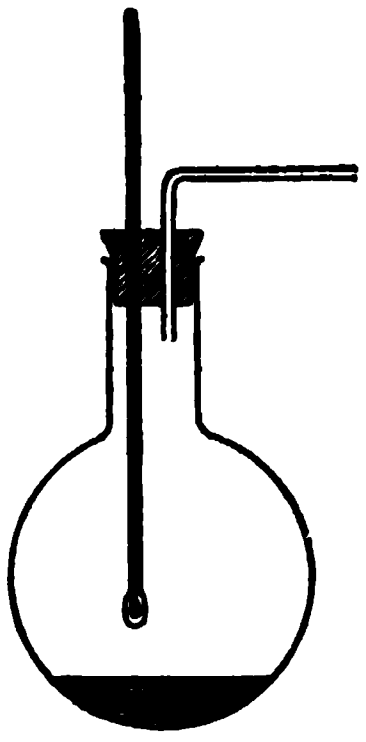

Fig. 46.

In doing this the thermometer bulb should be well cleaned after being in the salt water and before being placed in the steam. If any salt be allowed to remain on the bulb it will affect the result.

What is the effect of the salt on the temperature of the water while it is boiling? What is the effect of the salt on the temperature of the steam which comes from the boiling water?

EXPERIMENT 22

Effect of pressure on boiling-point.

Using the same apparatus as in last experiment, fix to the end of the escape-tube a short piece of indiarubber tubing capable of being closed by a spring clip. Place the thermometer so that its bulb is just above the surface of the water, and, while the water is boiling freely, note its reading when steady, then close the escape-tube by the clip and notice the thermometer. You will find that it rises.

As soon as the thermometer has risen 2° above its reading

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one next to it above it. Thus the strain is one in which each little disc slides over the one next to it.

EXPERIMENT 31

To find the relation between the elongation of a stretched wire and the force producing it when the wire is stretched within its limit of elasticity. (*Hooke's Law.*)

Take two pieces of wire (brass or copper or steel), about 1 mm. diameter or less, and fix them to a support, so that when weights are attached to their free ends the wires hang side by side a few centimetres apart. The wires should be as long as can be conveniently suspended in this way from some firm support, and it is well to fix them in steel clamps like small vices screwed into a beam in the ceiling. To one wire hang a weight heavy enough to keep it tightly stretched, and to the other attach a scale pan sufficiently large and strong to carry weights up to 20 or 30 kgm. The former wire should be shorter than the latter, so that the two wires may be able to hang close together without the shorter wire being touched by the scale pan.

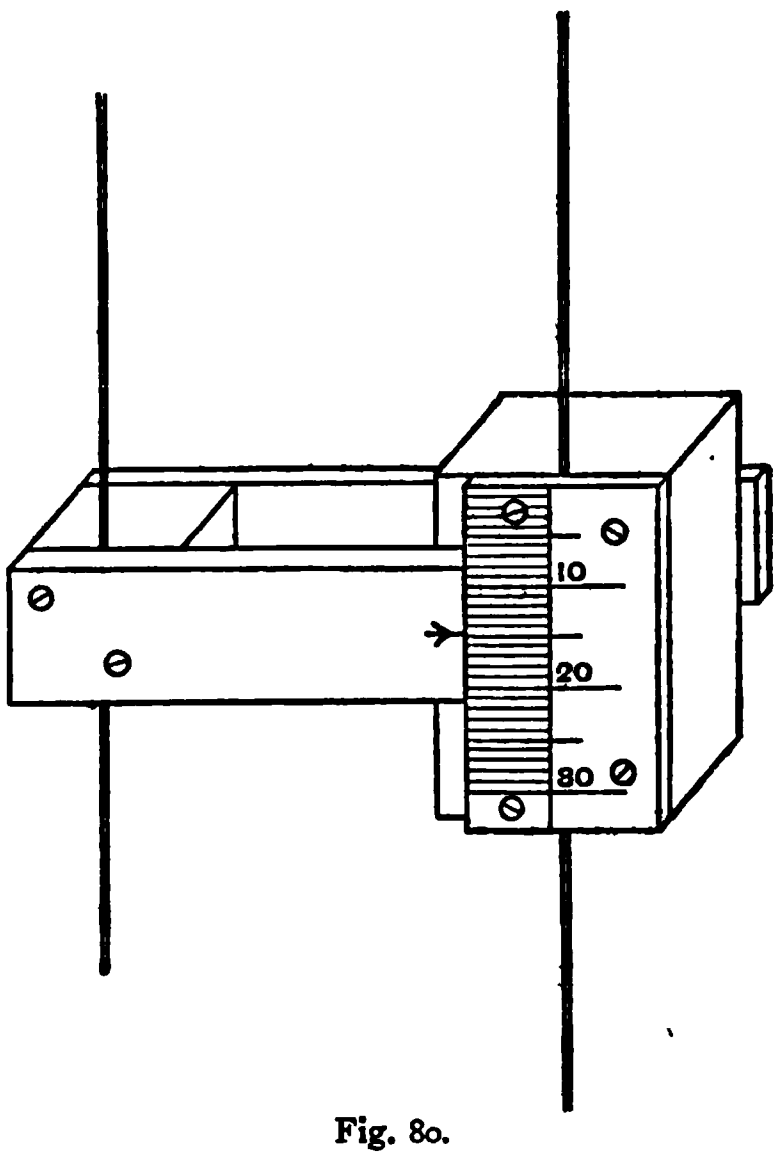

Fig. 80.

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motion which we call Heat; it is not momentum. There may have been no change in the momentum of the apparatus; yet there has been a gradual development of Heat. What then has been done? *Work has been done* on the handle of the whirling table which has been pressed with a definite force through a definite distance.

The 'Principle of Work' applies only to 'perfect' machines. In a real machine some work is done against friction, so that

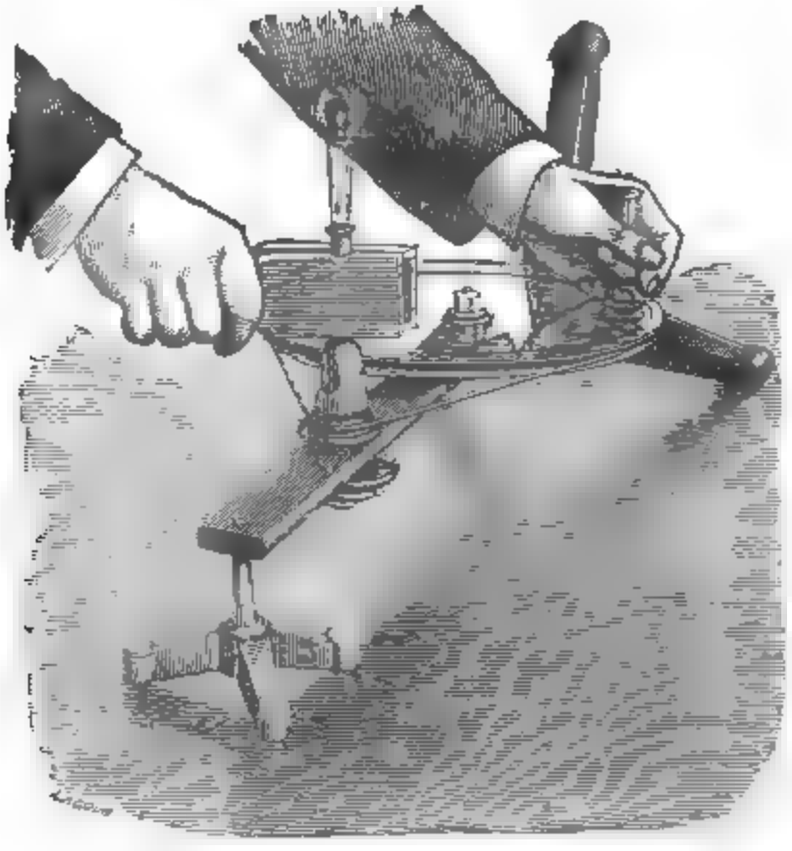

Fig. 58.—Friction and heat.

in practice the work done *on* a machine is not equal to the work done *by* the machine. The work done against friction produces kinetic energy in the form of heat.

Heat and Kinetic Energy.—A metal plunger fits well in a strong metal cylinder, at the bottom of which is placed a piece of tinder. Now if the plunger be put in the cylinder so as to enclose some air, and then be smartly pushed in, or better still, hammered in smartly with a heavy hammer, the air inside

[SPECIMEN PAGE]

wire in the same direction as the current; then the N. pole of the needle is urged round the wire the same way as the point of the corkscrew moves.

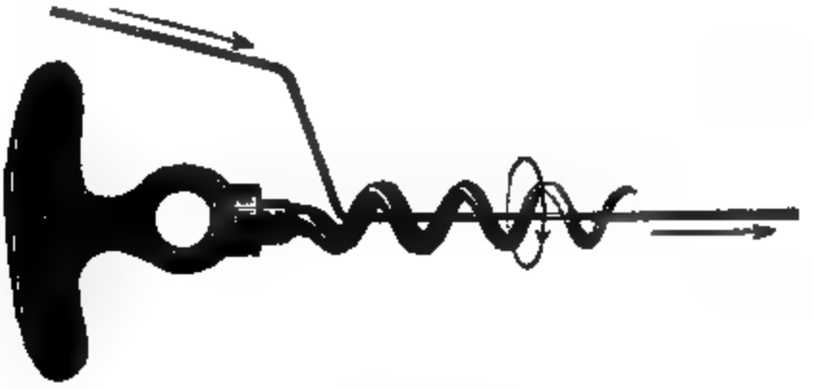

Fig. 56.—Screw movement of north pole and current.

Simple Galvanometer.—Bend a piece of stout copper wire into a rectangular shape as ABCD, and connect with the wires

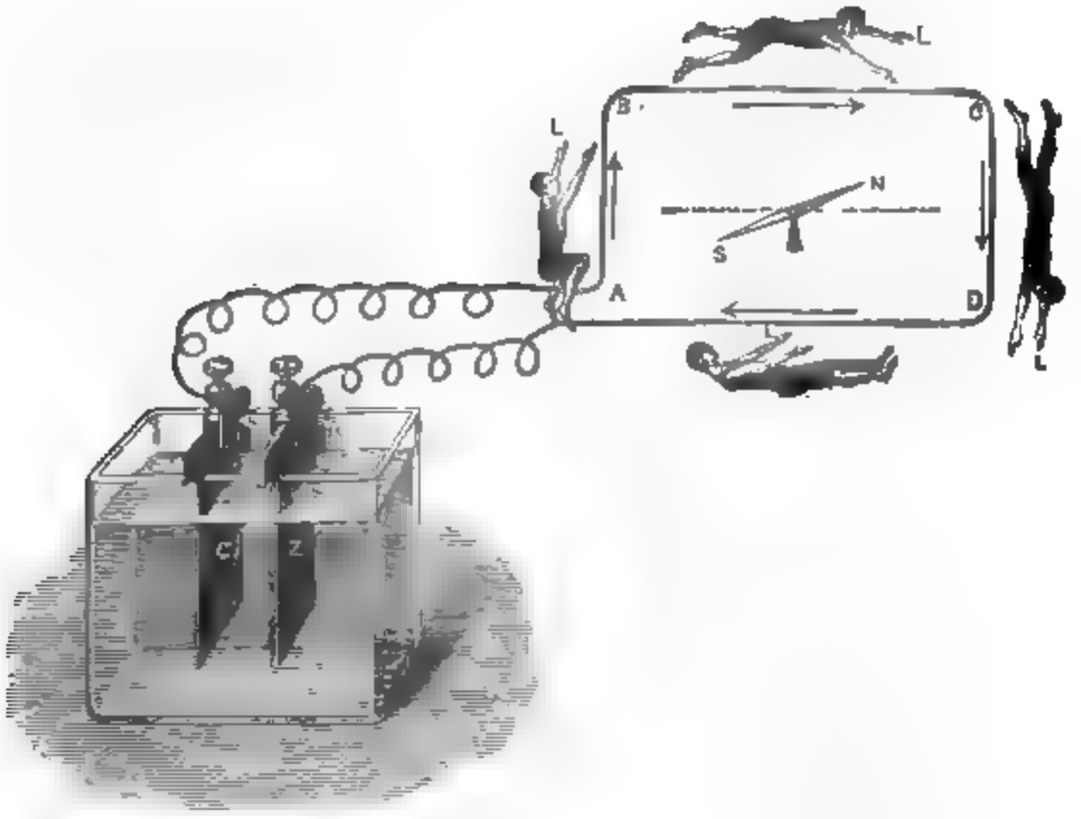

Fig. 57.—Action of current flowing round a rectangle.

from a simple voltaic cell; suspend a magnet needle in the middle, then the dolls as sketched show that all four sides, AB,

PREFACE

THIS Manual of Physics took its rise from a desire to relieve the subject of the foreign element of unreality, and to give a modern and practical course of Natural Philosophy in a compendious form.

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surface, it contains from 20·9 to 21 volumes of oxygen per cent. The gas left after the oxygen has been removed from air is not pure nitrogen, but contains 1·2 per cent. of another gas known as Argon (inactive). This gas has the density 19·8, and is remarkable for the fact that it forms no compounds with other elements. It is left behind when the nitrogen is absorbed by heated metallic magnesium.

Composition of Air by Weight.—When we know the composition of air by volume, and the relative densities of the

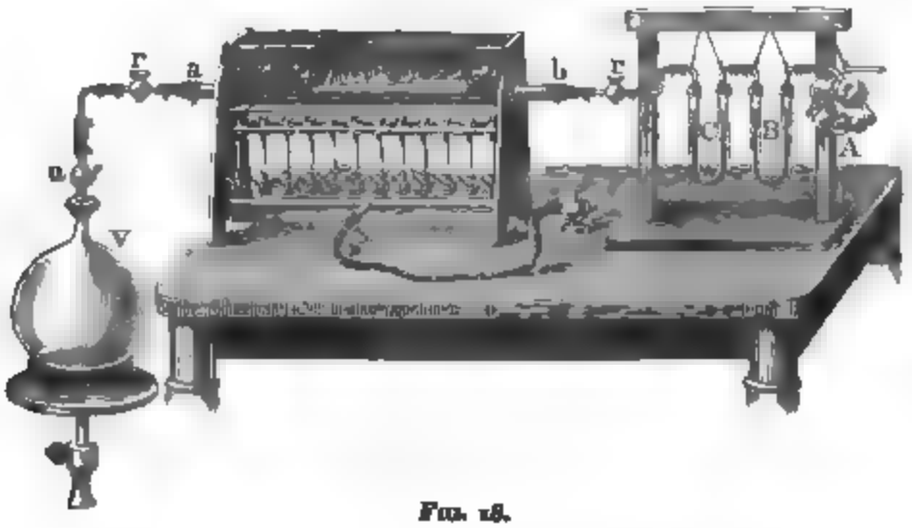

FIG. 18.

constituent gases, we can calculate its composition by weight. It is important, however, to determine this by direct experiment; for this purpose a large glass globe (*v* Fig. 18), furnished with a stopcock (*u*) is rendered vacuous by the air-pump and then weighed; a tube (*a b*) of hard glass filled with copper turnings and also furnished with stopcocks (*r*) is likewise weighed. This tube is then heated to redness in a long tube-furnace, and connected at one end with the empty flask, at the other with a series of tubes (A, B, C,) filled with caustic potash and sulphuric acid, for the purpose of completely freeing the air passing through them from carbonic acid and aqueous vapour; the cocks are then slightly opened, and air allowed to pass slowly through the purifiers into the hot tube, where it is completely deprived of oxygen by the hot metallic copper, which is thereby oxidised, the nitrogen

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the flask with water at the ordinary temperature, so that the water extends several inches into the tube. Now cool the vessel by placing it in ice or in a freezing mixture, and notice the contraction of the water indicated by the fall of the column of water in the tube. By means of this experiment, it can be shown also that the water expands as it is cooled below 4° C. (39.2° F.)

Just as water contracts when cooled, so it expands when heated, and when it reaches the temperature of 100° C. (212° F.), it is converted into an invisible vapour. When a given volume of water is converted into vapour, the vapour at 100° C. occupies about 1600 times the volume that the water did. When partly condensed, water-vapour is visible, and then it is called steam.

EXPERIMENT 58.—Fill a vessel with water at a low temperature and weigh it. Fill the same vessel with water at a comparatively high temperature. What difference do you notice? How do you account for the difference?

Arrange an apparatus, as for Experiment 57. Fill with water to the lower part of the glass tube. Heat, and notice change in position of the column of water. What does this prove? Compare the result with that reached in Experiment 57.

Water is a bad conductor of heat. When a mass of water is heated by a flame applied beneath it, the particles of water which are lowest first become heated. They expand and rise. The same changes take place in the next following particles, and so on until the whole mass becomes heated to the boiling temperature. The heat is thus distributed through the mass by means of currents caused by the heat. These are called *convection-currents*, and the process is called *convection*.

EXPERIMENT 59.—Heat a mass of water contained in a good-sized flask, and note the formation of currents from below. Some light powder, as powdered charcoal, put in the water will show the currents strikingly.

Boiling Point.—The boiling point of a liquid is that

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PREFACE

THE present volume is an enlarged edition of that published in 1887, and has been completely rewritten. The preparations have all been carefully revised, some of the former ones omitted and many new ones introduced. The chief additions are the introductory chapters on organic analysis and molecular weight determinations, and an extension of the appendix.

The book does not aim at being a complete laboratory guide, but is intended to provide a systematic course of practical instruction, illustrating a great variety of reactions and processes with a very moderate outlay in materials and apparatus.

The objection may be raised that the detailed description of processes makes no demand upon a student's resourcefulness or ingenuity. It must be remembered, however, that the manipulative part of organic chemistry is so unfamiliar to the elementary student that he requires minute directions in order to avoid waste of time and material. Until he has acquired considerable practical skill he cannot accomplish the experimental work requisite for research, and repeated failures will be apt to destroy his confidence in himself.

To satisfy, to a legitimate extent, the prejudices of certain examining bodies, who still adhere to the old system of testing a student's knowledge of practical organic chemistry by means of the qualitative analysis of certain meaningless mixtures, the special tests for some of the more common organic substances have been inserted. At the same time, an attempt has been made at the end of the appendix to systematise the analysis of organic substances on a broader and therefore more rational basis.

The present occasion seems opportune to direct attention to the fact that one of the most familiar, most readily procurable, and most cheaply produced of all organic materials is placed beyond the reach of many students by the heavy duty levied upon it. May I, in the name of teachers of organic chemistry, appeal to the Board of Inland Revenue, on behalf of scientific and technical education, to provide institutions for higher education in science with a limited quantity of pure alcohol free of duty, thereby placing schools of chemistry in this country in the same position as those on the Continent?

In conclusion I desire to thank Dr. J. McCree, who has written the section on Ethyl Tartrate and the use of the Polarimeter, Dr. T. S. Patterson, who has been kind enough to look over the proofs, and Mr. H. D. Dakin, who has given me substantial assistance in the practical work of revision.

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EXTRACT FROM PREFACE

It is now generally accepted by educationists that experimental work is an essential part of instruction in any branch of physical or natural science. Too much information cannot be attached to knowledge gained direct from Nature; and it is gratifying to know that many questions now set by public examining bodies are designed to test the student's own observations and experience. As an instance of this, it is worth pointing out that in the syllabus for Botany, published by the Department of Science and Art, the examiners remark:

"The examination will be especially directed towards ascertaining the amount and character of the practically acquired knowledge possessed by the students."

To provide students with a means of obtaining such knowledge, this little work has been prepared in the spirit of the foregoing remarks, as a guide to beginners in the practical study of plants. The attempt is often made to study Botany without the practical examination of plants, and it has produced on the popular mind an impression that the subject is uninteresting. This is the result of the old method of teaching Botany by means of ideals or definitions; the new method is to examine the plants from as many points of view as possible, and to draw conclusions from the actual observations. Studied in this way, the subject becomes of living interest instead of a collection of technical names and terms. It is with the idea of placing in the hands of all persons interested in the study of plants a book which shall be a guide and companion during a first course that the present volume has been prepared. Though the book has been primarily designed to cover the syllabus of the Department of Science and Art, it is by no means a "cram-book" for that particular examination, and a thorough knowledge of its contents will not only lay the foundation for further work, but should enable a student to pass any elementary examination in Botany with distinction. The book should also be useful to teachers in elementary schools, in assisting them to prepare object lessons with plants for the instruction of their pupils.

Teachers are recommended to see that the students perform the experiments, and keep a complete record of the results obtained. Most of the plants necessary for the experiments can be easily obtained; others can be grown in the school grounds. A small collection of fruits, seeds, dried and mounted plants, should be kept in all schools.

It is hoped that the introduction into this book of a series of carefully graded experiments with simple apparatus will prove useful to many students and teachers, and will be the means of making botanical science a more popular subject in the future than in the past.

CONTENTS

CHAPTER I. Introduction; II. Morphology—Study of the Body of a Plant; III. Anatomy—Study of the Shoot; IV. The Study of the Shoot (*continued*); V. Anatomy—Study of Roots; VI. Sections, how to Prepare and Examine Them; VII. The Histology of the Cell; VIII. The Histology of the Tissues; IX. The Histology of the Shoot and Root; X. The Physiology of Nutrition; XI. The Absorption and Movement of Water in the Plant; XII. The Physiology of Growth and Movement; XIII. Flower and Inflorescences; XIV. The Terms Used in Describing the Flower; XV. The Development and Morphology of the Flower; XVI. Pollination and Fertilisation; XVII. The Morphology of Seed and Fruits, and their Distribution; XVIII. The Physiology of Reproduction; XIX. The Classification of Plants; XX. Classification of Plants (*continued*); XXI. Plant Description; Index.

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[SPECIMEN PAGE]

5. No general bundle-sheath is present, though each bundle is surrounded by a layer of colourless cells, without intercellular spaces, which may be regarded as representing the bundle-sheath.

B.—LAMINA.

I. Take a piece of the lamina of the leaf of the Sunflower, including the apex : it is important that it should be previously bleached by treatment with alcohol : warm it gently in a mixture of dilute glycerine and potash, and mount in glycerine : examine with a low power, and observe—

1. The **midrib**, with its strongly marked **vascular bundle**, running up to the apex of the leaf, where it terminates abruptly in a mass of glandular tissue.

2. Lateral **branch-bundles**—the **ribs** or **nerves**—passing off from it, and forming a network by frequent anastomoses, while some of them run up into and terminate in the serrate projections of the margin of the lamina.

3. Smaller branch-bundles sometimes showing **blind endings** in the parenchyma which fills the meshes of the network.

II. Cut off a small square piece of the lamina of a leaf of *Helianthus*, including one of the main **ribs** or **nerves**, and embed in paraffin (see directions, p. 9), so that the rib shall be perpendicular. Cut transverse sections, and mount in glycerine.

Good sections may be obtained even from fresh material by holding the piece of lamina between slices of carrot, or pith ; or by folding the whole lamina repeatedly, and cutting sections from the whole mass.

Note with a low power—

1. The general outline of the section, which is irregular and undulating, though it is in the main of uniform breadth. At the point corresponding to the main nerve the section widens out, the nerve appearing **semilunar**, as in the petiole. The convex side is the inferior (**adaxial** or **dorsal**), and the concave the superior (**abaxial** or **ventral**) surface.

2. That the margins of the sections (*i.e.* the superior and

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PREFACE

I HAVE given the title of "Round the Year" to a series of sketches suggested by the natural events of the year 1895. The principles of selection have been simple: I have written upon things which happened to interest me at the time, which seemed to admit of popular treatment, and which had not been fully discussed, so far as I knew, in elementary books. Another naturalist would have

made a different choice ; all the naturalists in the world could not exhaust the subject.

The readers whom I hope to find are observers (especially young observers) of out-of-door nature, teachers of elementary science, and all who care for Live Natural History. L. C. M.

TABLE OF CONTENTS

"Man sieht nur was man weiss"—Insects and Plants in Mid-Winter—White of Selborne—Snow-flakes—Buried in the Snow —Birds in Mid-Winter—The Depth to which the Ground Freezes —The Great Frost of 1895—Under the Crags—Phi and Theta—Which are the Wettest Months?—Animals with and without Combs—The Moon—Spring Crocuses—Catkins—The Oil-Beetle (Meloe)—The Corn-rigs of Beamsley Fell—The Cuckoo—Buds—The Botany of a Railway Station—Summer Twilight—Midsummer Blooms—Hay-time—The History of the Cabbage White Butterflies—Cabbages and Turnips—Duckweed—Routine—Weeds—Moorland Plants—The Love of Mountains—The Reversed Spiral—Gossamer—Flower-haunting Insects—Tennyson as a Naturalist—The Structure of a Feather—The Fall of a Leaf—Autumn Winds and Winter Floods—The Shortest Day of the Year.

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I HAVE here attempted to help those naturalists, especially those young naturalists, who take delight in observing the structure and habits of living animals. It has also been my hope that I might do something to revive an interest in the writings of certain old zoologists—Swammerdam, Réaumur, Lyonnet, and De Geer—who are at present unjustly neglected; I have tried to carry on as well as to popularise their work. It would be much if I could persuade some few working naturalists to lay aside their technical lists and records of parish distribution, and study the works of Nature with open eyes, seeking above all things to know more of life in its infinitely varied forms.

CONTENTS

CHAPTER I. Aquatic Beetles.—II. Flies with Aquatic Larvæ.—III. Aquatic Hymenoptera.—IV. Aquatic Caterpillars.—V. Caddis-Worms (Trichoptera).—VI. Sialidæ.—VII. Perlidæ.—VIII. May-Flies (Ephemeridæ).—IX. Dragon-Flies (Odonata).—X. Pond-Skaters, Water-Scorpions, and Water-Boatmen (Rhynchota).—XI. The Water Spring-Tail (Podura).—XII. Insects of the Sea-Shore.—XIII. The Contrivances of Aquatic Insects.

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PREFACE

THIS book is an outgrowth of a rich, varied, and thoughtful experience with child nature and the nature that surrounds the child. Mrs. Wilson recoguizes the truth that children have a deep, strong, instinctive love for all things that live and all things that support life. The teacher should develop instinct into habit by making spontaneity the basis of character.

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The pressing need of the hour is genuine students of education, teachers who bring to every child and every subject a mind full of desire to know, an abiding faith in boundless possibilities, a freshness of spirit that is in itself the most potent factor in education, a devotion that inspires new contributions to the unlimited science of teaching.

This book is such a contribution, and I am sure it will be a great help to many teachers who are struggling with the problem of Nature study.

FRANCIS W. PARKER.

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SEPTEMBER.—*Weather*: Appearance and Names of Clouds; Blackboard Record; Direction and Velocity of Wind; Excursions; Rain.—*Plants*: Aster; Black-eyed Susan; Butter and Eggs; Chicory Ferns; Garden Nasturtium; Goldenrod; Ironweed; Jamestown Weed; Morning Glory; Pond Lily; Sunflower; Thistle; Wild Carrot.—*Animals*: Bee; Beetles; Cicada (Locust, or Harvest Fly); Dragon Fly; Fly; Locust (Grasshopper); Mosquito; Moths and Butterflies (general); Tussock Moth.

OCTOBER.—*Weather*: Excursions; Records; Sun.—*Plants*: Flowers (*continued*). See list under September.—*Fruits*: Ailanthus; Apple; Ash; Burdock; Chestnut; Maple; Stick-me-tight.—*Animals*: English Sparrow: Insects (*continued*). See list under September.

NOVEMBER.—*Weather*: Examination of October Record; Moon; Temperature.—*Plants*: Buds; Bulbs; Falling Leaves; Fleshy Roots.—*Animals*: Cocoons; Other Preparation for Winter; The Pigeon.

DECEMBER.—*Weather*: Examination of November Record; Record; Snow; Stars.—*Plants*: Arbor Vitæ; Balsam Fir; Hemlock; Holly; Mistletoe; Pine; Spruce.—*Animals*: Fish; Mussels; Snail; Tadpole.

JANUARY.—*Weather*: Boiling; Condensation; Evaporation; Examination of December Record; Record.—*Plants*: Evergreens (*continued*). See list given under December; Germination.—*Animals*: Beaks and Feet of Birds; Bones of Birds; Crow; Feathers; Owl; Woodpecker.

FEBRUARY.—*Weather*: Clouds; Dew; Frost; Hail; Rain; Records; Snow.—*Plants*: Germination (*continued*); Seed Food-supply.—*Animals*: Chickadee; Golden-crowned Kinglet; Snowbird; Winter Wren.

MARCH.—*Weather*: Records.—*Plants*: Buds; Seed Food-supply (*continued*).—*Animals*: Blackbird; Bluebird; Earthworm; Excursions; Migration; Robin.—*Stones*: Clay; Feldspar; Mica; Pebbles; Quartz; Sand; Soil.

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[SPECIMEN PAGE].

the east and west of this locality was made in the last chapter. Being able, however, to now regard the earth as a spinning globe, we are in a position to explain this difference more fully. Fig. 78 makes the matter very simple. The student must suppose himself in space looking down upon the north pole of the earth, which is situated at the intersection of the diameters of the circle representing the equator of the earth. The circle is divided into twenty-four equal parts, and hence the angle between any pair of radii will be 360 divided by 24, or 15 degrees.

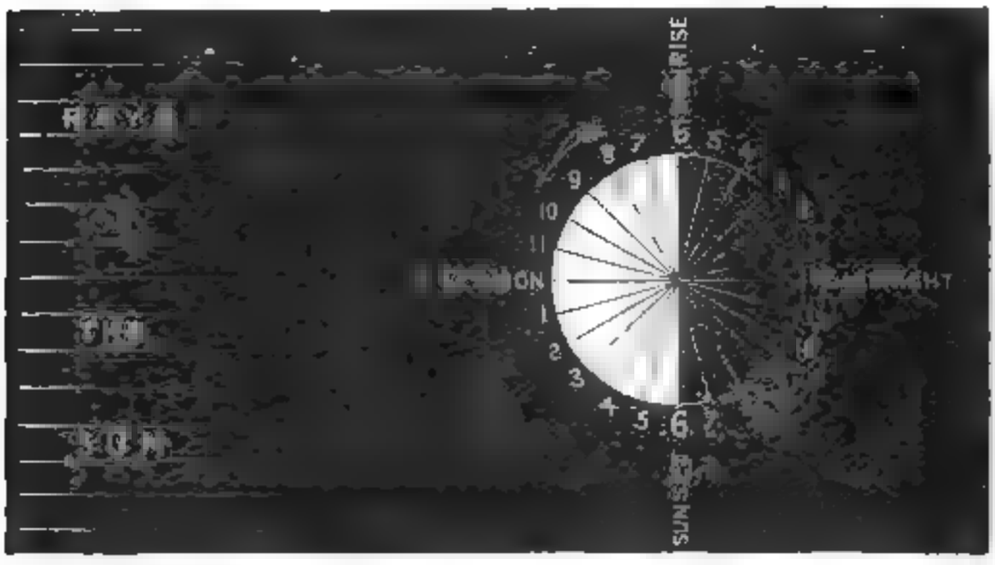

FIG. 78.—To explain the different times at places east and west of Greenwich.

As the globe spins round each radius in turn occupies the position of that one marked "12 noon." An observer in this position will see the sun in his highest position for the day, or on the meridian, that is, southing. The observer situated at the opposite end of the same diameter will be as far away from the sun as he can possibly be. Or, to take an example, at places longitude 180° it will be twelve o'clock midnight when it is twelve o'clock noon at Greenwich. When the sun is on the [illegible]dian at Greenwich at places 90° W. and 90° E. it will be [illegible]ck in the morning and six o'clock in the evening

Mo[illegible]
(contin[illegible]
Sandstone

APPENDIX. [illegible] it is twelve o'clock noon at Greenwich, at

[SPECIMEN PAGE]

stem of the barometer shown in Fig. 95, the mercury column to its upper limit in the long tube, the air to its upper limit, which as will be seen, is a great distance from the surface of the earth. If for any reason the weight of the atmosphere becomes greater, the mercury will be pushed higher to preserve the balance; if it should become less, then similarly the amount of mercury which can be supported will be less, and so the height of the column of mercury is diminished.

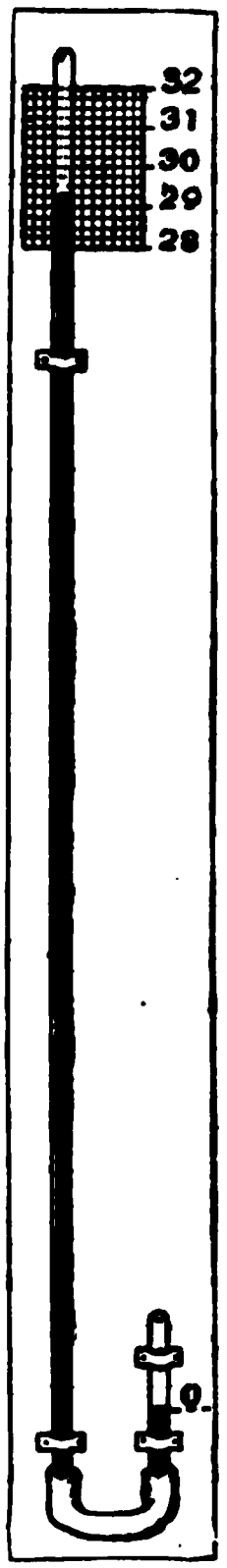

FIG. 95.—To explain the Principle of the Barometer.

The student will now understand why it is so necessary to remove all the air bubbles in Expt. 193. If this were not done, when the tube was inverted the enclosed air would rise through the mercury and take up a position in the top of the tube above the mercury. The reading would not then be thirty inches, for instead of measuring the whole pressure of the atmosphere, what we should really be measuring would be the difference between the pressure of the whole atmosphere and that of the air enclosed in the tube. In a properly constructed barometer, therefore, there is nothing above the mercury in the tube except a little mercury vapour.

An arrangement like that described constitutes a *barometer, which we can define as an instrument for measuring the pressure exerted by the atmosphere.*

§ EXPT. 194.—Procure a thick glass tube about thirty-six inches long and closed at one end. Fill the tube with mercury; place your thumb over the open end; invert the tube; place the open end in a cup of mercury and take away your thumb. A column of mercury will be supported in the tube by the pressure of the atmosphere. The distance between the top of the column and the surface of the mercury in the cup will be about thirty inches.

§ EXPT. 195.—Weigh the column of mercury sustained in the barometer

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[SPECIMEN PAGE]

whole melts, its valley is seen to have assumed the form of smooth undulating prominences, in appearance not unlike the back of dolphins as they appear at the surface of the water in which they are rolling. These rounded mounds are called *roches moutonnées*, from a similar likeness they exhibit to the backs of sheep.

The water formed from the local melting of a glacier collects on the surface and often finds its way down one of the numerous crevasses, carrying with it a considerable quantity of the moraine detritus. This water finally gets under the glacier, and in many cases, by the help of the stones it carries with it, erodes a kind of pot-hole, which is in some places spoken of as

FIG. 111.—Glacial Striations at Kingston, Ohio.

a *giant's kettle*. As was pointed out in describing the same sort of work in the case of rivers, the largest amount of erosion will be effected in those cases where the rocks are soft. It is sometimes indeed sufficiently extensive to form considerable hollows, which on the retirement of the glacier often becomes filled with water, forming *tarns* or *lakes* (p. 150).

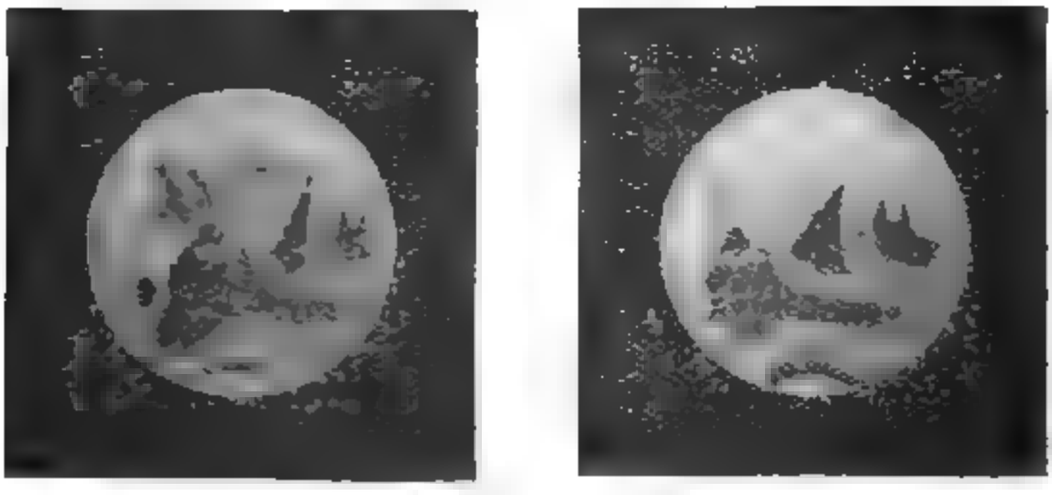
Results of Glacial Action.—The student will readily perceive that it is quite possible to tell where glaciers have been from the permanent record they leave behind. We can summarise the occurrences, the existence of which in any country can be taken as proof of the previous existence of glaciers.

[SPECIMEN PAGE]

Physical Features of Mars.—The planet Mars generally presents the aspect of a ruddy disc, which is, as before remarked,

FIG. 162.—Mars on August 29, 1894, showing the Planet in the Gibbous phase. (From a Drawing by Mr. Percival Lowell in *The Astrophysical Journal*, No. 128).

gibbous in form at stated times. Its surface markings can be distinctly made out with a telescope having a four- or five-inch



1892, August 17d., 10h. 32m. 1892, August 17d., 11h. 55m.

FIG. 163.—The Planet Mars, as drawn by Prof. James E. Keeler on August 17, 1892. The South Polar Cap is shown in each of the Drawings.

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5. (2) A further feature in the distribution of lakes, which may be observed on maps, is the more or less abundant occurrence of these sheets of water among

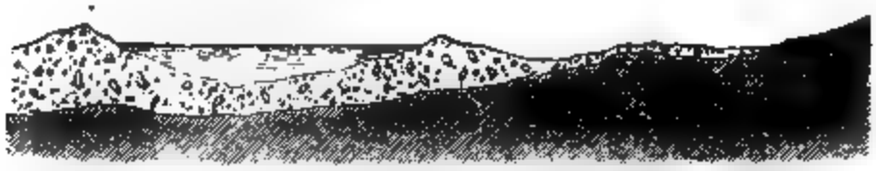

FIG. 53.—Section of a lake-basin lying in a hollow of superficial detritus.

mountains. Take Europe as an illustration. Even in the comparatively low mountain groups of Scotland, Cumberland, and Wales, lakes abound, forming one of the great charms of the well-known scenery of these districts. Among the Alps a series of large lakes occurs on each side of the main axis of the chain, and innumerable minor sheets of water occur scattered at all heights among the central mountains, up even to the borders of the snow-line. All mountain systems, indeed, have not

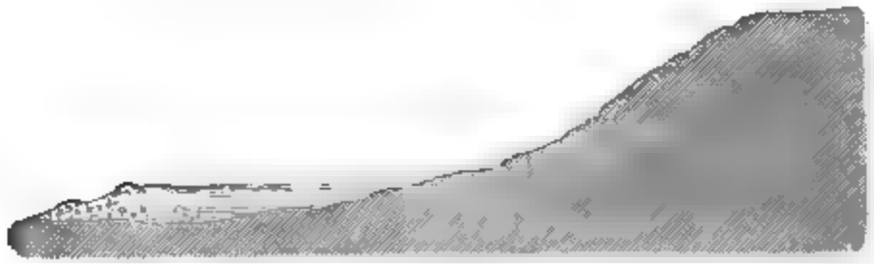

FIG. 54.—Section of a lake dammed up by a barrier of earth or gravel.

the same abundance of water-filled hollows; in some there are few or none. Lakes among mountains may be, in some cases, hollows formed during the elevation of the mountains (Lesson XXIX.); in other examples, like those referred to in Art. 4, they may either have had their basins scooped out by glaciers or formed by the irregular piling up of ice-borne debris (Fig. 54). In most volcanic districts, lakes occur in cavities which have been formerly blown open by explosions from

1892, —

FIG. 163.—The Planet Mars
1892. The South Polar.

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EXTRACT FROM PREFACE

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While primarily intended for use in preparation for the elementary stage of the Science and Art Examination, care has been taken to make the book suitable for school work and for the examinations of the Oxford and Cambridge Schools' Examination Board. With this object in view there have been placed at the end of the chapters all the Questions set in the Science and Art Examination during the last twenty years, and those of the Oxford and Cambridge Board for ten years.

Naturally in writing this book no other elementary work of the class has been consulted, but no one who has ever read the late Professor Green's classic work on Physical Geology can help being attracted by the lucidity of his style and influenced by the charm of his methods. The writer owes an especial debt for the advice and assistance given him when acting as Professor Green's deputy on two occasions several years ago. The principal methods pursued in two or three of the earlier chapters, and the general practical aim of the book as a whole, are due directly to Professor Green's advice.

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SPECIMEN PAGES

brought by rivers and currents. The pebbles are laid down as shown in Fig. 49, in such a way as to oppose the greatest resistance to being lifted again by currents.

FIG. 49.—Deposition of pebbles under the influence of a current.

The *sand* is interesting because the perpetual movement of the waves imprints on it the beautiful ribbed surface known as ripple-mark, see Fig. 50. Shell-fish, crustaceans like crabs

FIG. 50.—Ripple-marking on sand; also formation of sea-caves by denudation along planes of bedding and jointing. (From a photograph by Mr. G. T. Atchison: copyright.)

and lobsters, worms, and other animals, moving over it between tide-marks, leave their tracks and burrows, which may occasionally be preserved if a coating of mud or fine sand is deposited upon them. Even rain-prints indented by a passing shower, and cracks caused by the drying and shrinking of sand or mud under the sun's rays where it is left dry by the tide, may under favourable circumstances be preserved (Fig.

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supplied its own contribution of detritus. Thus from a region of red sandstone, the rubbish would be red and sandy; from one of black slate, it would be black and clayey (see Chapter XXVI).

Summary.—In this chapter we have seen that Ice in various ways affects the surface of the land and leaves its mark there. Frost, as already explained in Chapter II, pulverises soil, disintegrates exposed surfaces of stone, and splits open bare rocks along their lines of natural joint. On rivers and lakes, the disrupted ice wears down banks and pushes up mounds of sand, gravel, and boulders along the shores. Snow lying on the surface of the land protects that surface from the action of frost and air. In the condition of avalanches, snow causes large quantities of earth, soil, and blocks of rock to be removed from the mountain-slopes and piled up on the valleys. In the form of glaciers, ice transports the debris of the mountains to lower levels, bearing along and sometimes stranding masses of rock as large as cottages, which no other known natural agent could transport. Moving down a valley, a glacier wears away the rocks, giving them a peculiar smoothed and striated surface which is thoroughly characteristic. By this grinding action, it erodes its bed and produces a large amount of fine sediment, which is carried away by the river that escapes at the end of the ice-stream. Land-ice thus leaves thoroughly distinctive and enduring memorials of its presence in polished and grooved rocks, in masses of earth, clay, or gravel, with striated stones, and in the dispersal of erratic blocks from principal masses of high ground. These memorials may remain for ages after the ice itself has vanished. By their evidence we know that the present glaciers of the Alps are only a shrunk remnant of the great ice-fields which once covered that region; that the Scandinavian glaciers swept across what is now the bed of the North Sea as far as the mouth of the Thames; and that Scotland, Ireland, Wales, and the greater part of England were buried under great sheets of ice which crept downwards into the North Sea on the one side, and into the Atlantic on the other (Chapter XXVII).

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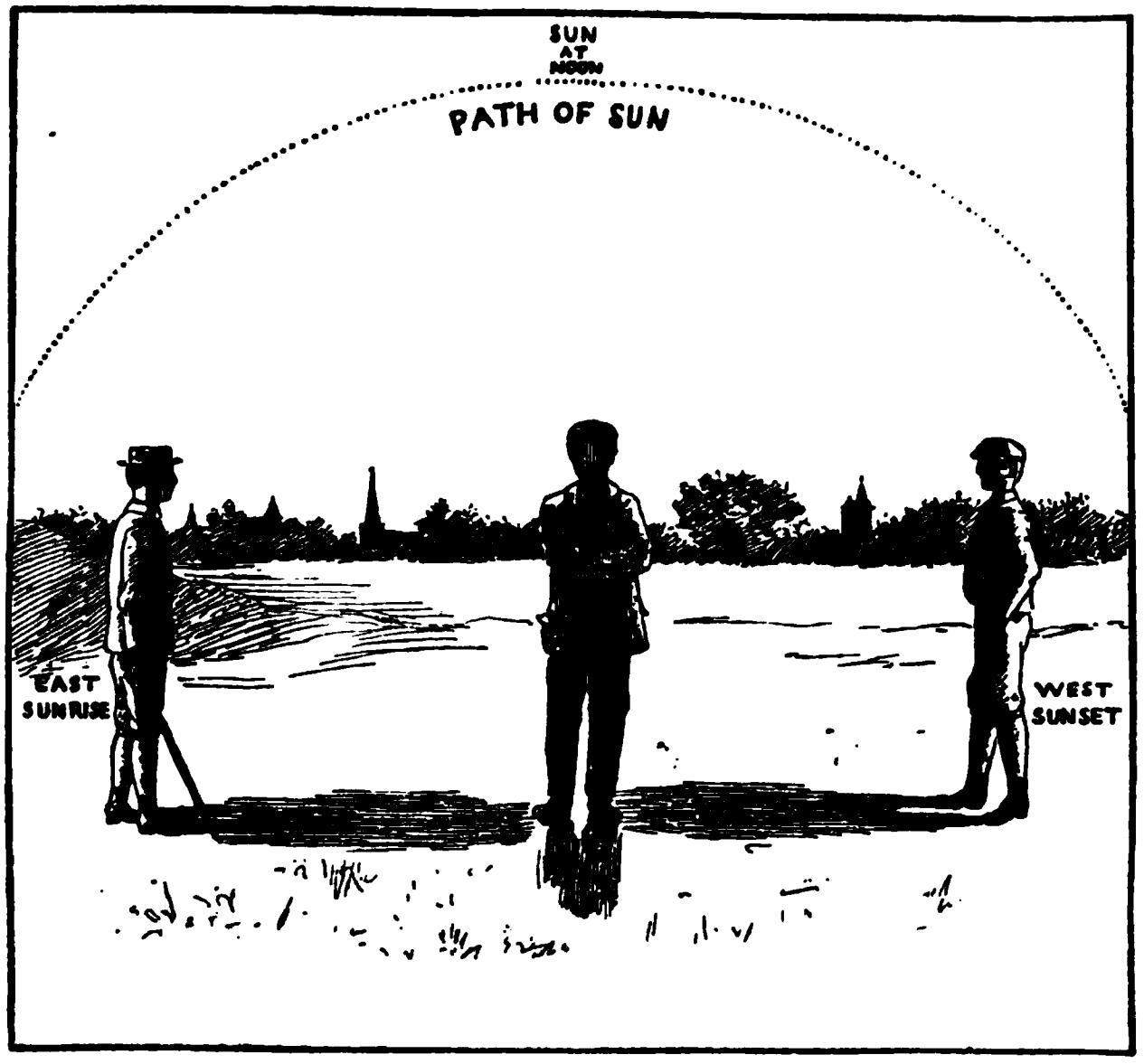
his father. Jack looked at the shadow and at the stick, and also at his own shadow. He saw that it was the sun which caused the shadow.

4. "Where is the sun now, Jack?" "In the East, father." "Now look at the shadow," said his father, "and tell me which way it points." "To the West," said Jack.



5. "It is now six o'clock," said Mr. Green. "If you come here to-morrow

4. "What is a desert, uncle?" asked Tom. "It is a great sandy plain. For miles and miles nothing can be seen but sand and stones. There are no trees except in a few fertile spots, called oases, which are sometimes hundreds of miles apart."

5. "These oases are lower than the surrounding land, and in them water is found, and a few palm trees. People cross the deserts on camels."

6. "Oh yes, uncle," said Tom, "I remember teacher giving us a lesson on the camel. He

83 ...en built in them. Neither was the whole built at one time. Some of the old walls were perhaps built by the Romans, or Saxons. William, the Conqueror, built a portion of them; and other kings added to it in later times.

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the coast as shown on the map. The northern portion is wild and rugged in character. It is cut into by two arms of the sea—Loughs Swilly and Foyle, the latter forming a good harbour.

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5. Malin Head, the extreme northern point of Ireland, lies at the extremity of the peninsula formed by the inlets just named. Fair Head is the most north-easterly point, and the coast here, and for some miles westward, is the most interesting in the island.

6. It is formed of basalt, or old lava-rocks, arranged in huge columns or pillars having from three to six sides—more often six. The pillars fit evenly and closely, and each seems to be built up of pieces neatly joined together.

mules. In some places paths have been constructed on the edges of precipices, and in other places it has been necessary to cut tunnels through projecting rocks.

7. It is not only over the surface of the Alps that man is able to force his way; right under the

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which could not be given, because the Sepoys had risen in that city also. Then in his distress he sought the aid of Nana Sahib, a native prince, who lived in a magnificent palace twelve miles away, and had always been on friendly terms with him. Nana

THE WELL AT CAWNPORE.

promptly replied to the invitation by collecting his troops, marching on Cawnpore, and attacking the place of refuge of the old British General, who stubbornly defended it.

7. At length Nana agreed, under the veil of clemency and friendship, to give the garrison a safe conduct as far as Allahabad, provided they sur-

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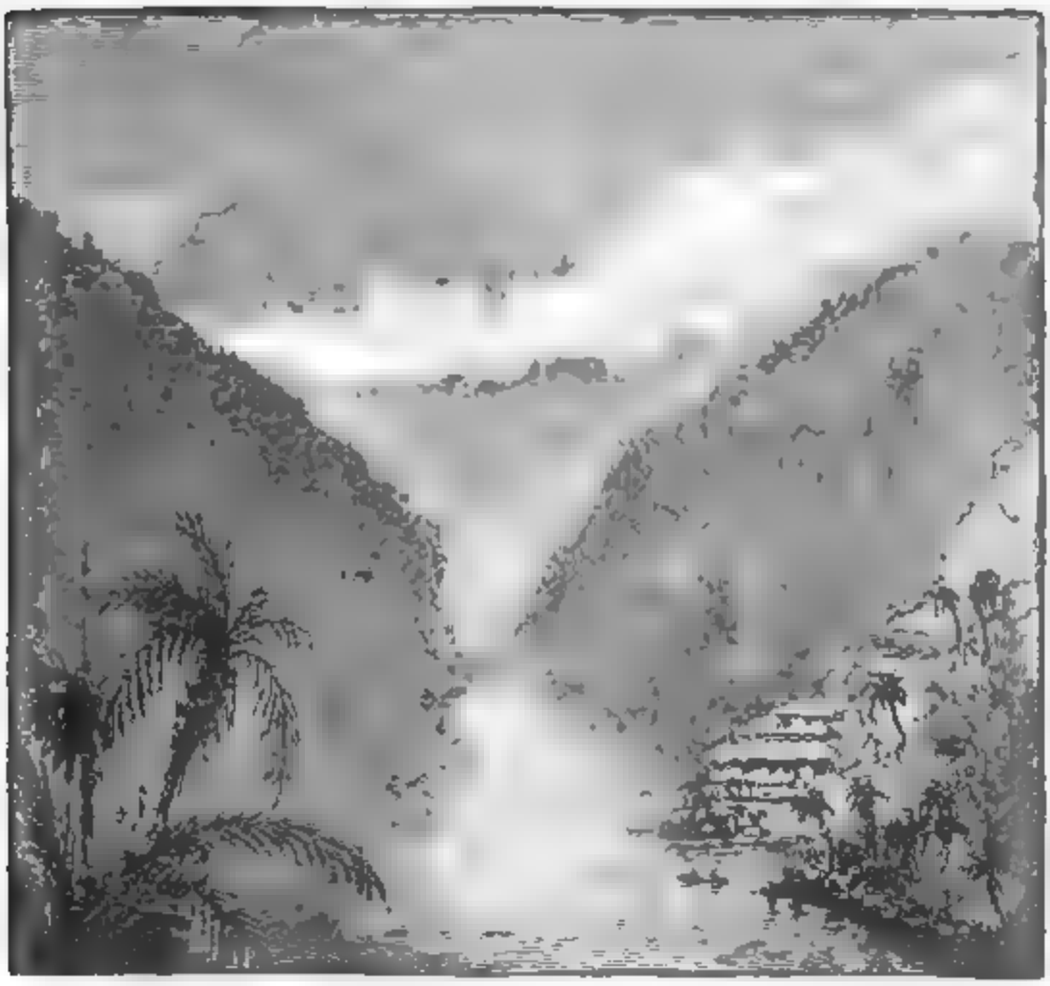

FIG. 11.—A SCENE IN JAVA, SHOWING A RIVER VALLEY, PALM-TREES, AND ACTIVE VOLCANO.

274. JAVA, crowded with volcanoes, which rise above the most gorgeous tropical forests, alive with brilliant birds and insects, is the wealthiest of the Dutch East Indies. An old crater, named the *Guevo Upas* or Poison Vale, in one of the forests, exhales carbonic acid gas, and the margin is said to be strewn with skeletons of beasts and men that went too near the deadly hollow. Most of the hot low-lying land is laid out

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25,000, of whom nearly 6000 are soldiers forming the garrison. It is a coaling station, and a port of call for vessels bound to or from the various ports of the Mediterranean.

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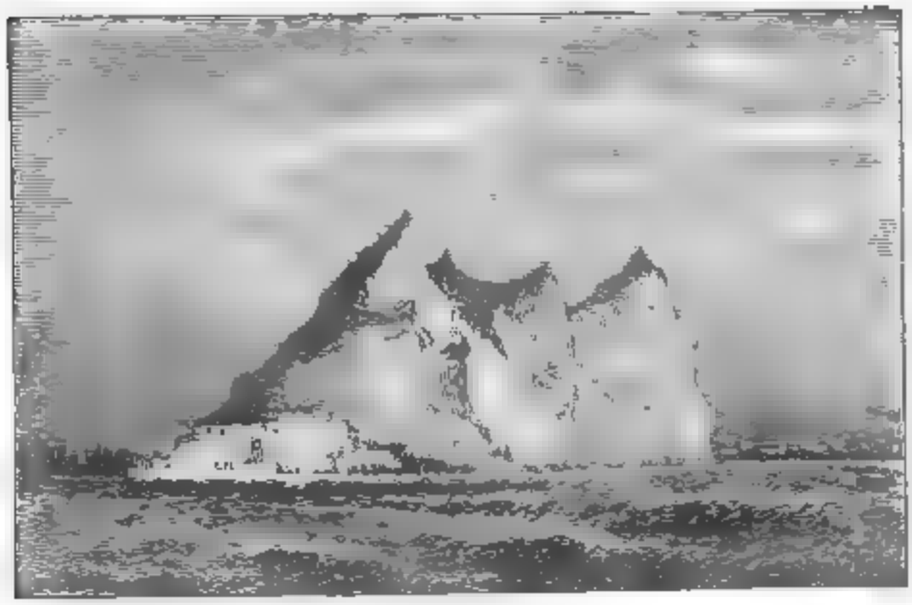

FIG. 28.—GIBRALTAR.

harbours, of which the best resembles a large artificial dock. On this inlet lies the chief town and seaport, called Valetta. Landing at this place the visitor finds himself in front of flights of stairs, which he must climb, for the whole island is high. In the town itself the streets at first are really stairs, but the upper and busy part is a city of stately but much-decayed splendour. The narrow streets are bordered with lofty mansions, the projecting balconies of which are wrought with so much taste and beauty as to suggest, what is really true, that this city was once the abode of merchant-princes. Fine churches, spacious convents, and marble-fronted

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[SPECIMEN PAGE]

the Ganges and Jumna; the seat of the provincial government since 1857; also a place of Hindu pilgrimage. In the fort is a column bearing an inscribed edict of Asoka of the third century B.C. Bareilly (113,000), in Rohilkand, on the Rámganga, 96 miles above its confluence with the Ganges.

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FIG. 11.—THE TÁJ MEHÁL, AGRA.

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[SPECIMEN PAGE]

hilly district descending from the Sierra Nevada. Past it flows the Jenil, and the neighbouring country is covered with olive-groves, fig-trees, and pomegranate-trees, and produces in lavish abundance the vine, the jasmine, and the myrtle. On the top of one of the two hills on which the greater part of Granada is built stands the famous Moorish palace, the **Alhambra** ("The Red," so called from the reddish hue of the walls by which it is surrounded).

FIG. 11.—THE ALHAMBRA.

Granada has also a splendid cathedral and a university. Its chief manufactures are silk and paper.

Passing westward from Cape Tarifa, the southernmost point of Andalusia, we come to **Cape Trafalgar**, a name famous in the naval history of England. CADIZ (pop. 57,100), representing the Phœnician Gades, is the oldest city in western Europe. It is strongly fortified, and is the chief centre of the export trade of Spain. Behind it is JEREZ, from which comes the wine called sherry, the word being a corruption of the name of the town. From a port

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[SPECIMEN PAGE]

it receives from the west the important tributary, the Bahr-el-Ghazal, which brings in the combined waters of a wide extent of country to the west. It is the last permanent tributary from this direction. The last part of its course is swampy and choked with vegetation like the main river. After this the Nile makes a sudden bend

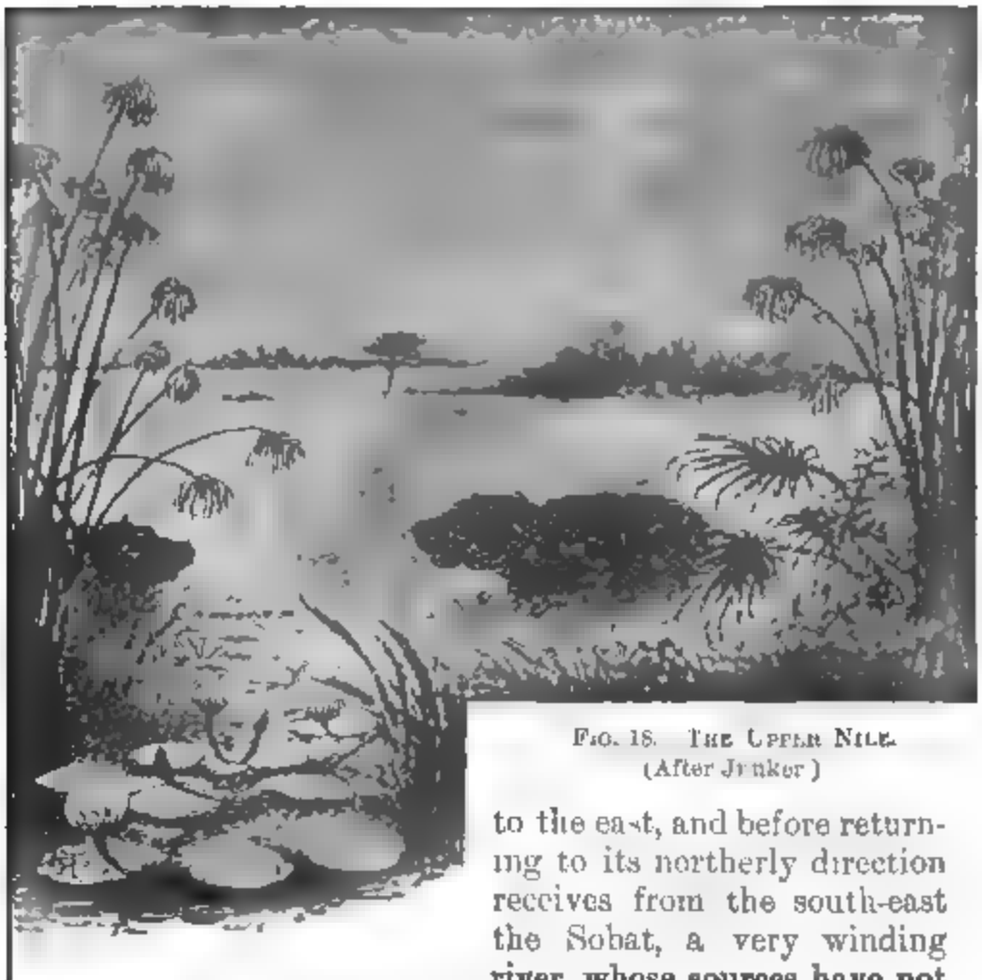

FIG. 18. THE UPPER NILE.
(After Junker.)

to the east, and before returning to its northerly direction receives from the south-east the Sobat, a very winding river, whose sources have not yet been explored. After passing 15° N. latitude, this southern branch of the Nile, known as the White River or Bahr-el-Abiad, is joined by the great eastern branch, the Bahr-el-Azrek or Blue River, and after 180 miles more by the Atbara, both having their sources in the highlands of Abyssinia. The Atbara is the last permanent stream which joins the Nile, which here begins to flow

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EXTRACT FROM PREFACE

THE much greater attention paid to Geography in recent years, especially in Germany and the United States, has attracted notice in this country; and parents are constantly and urgently demanding that their boys should have "a *good general* knowledge of Geography," such as will fit them for business. The time allotted to the subject in school is, however, still very small—in my own case, forty-five minutes a week with each class. Consequently, there must be from the outset a recognition of these limitations; and this involves an arbitrary selection of the matter to be taught, and every possible device for saving time.

In making this selection I have been guided by two considerations: that the matter *must* be at once valuable and interesting, and that it *must* be presented in such a way as to appeal primarily to the reason and the imagination.

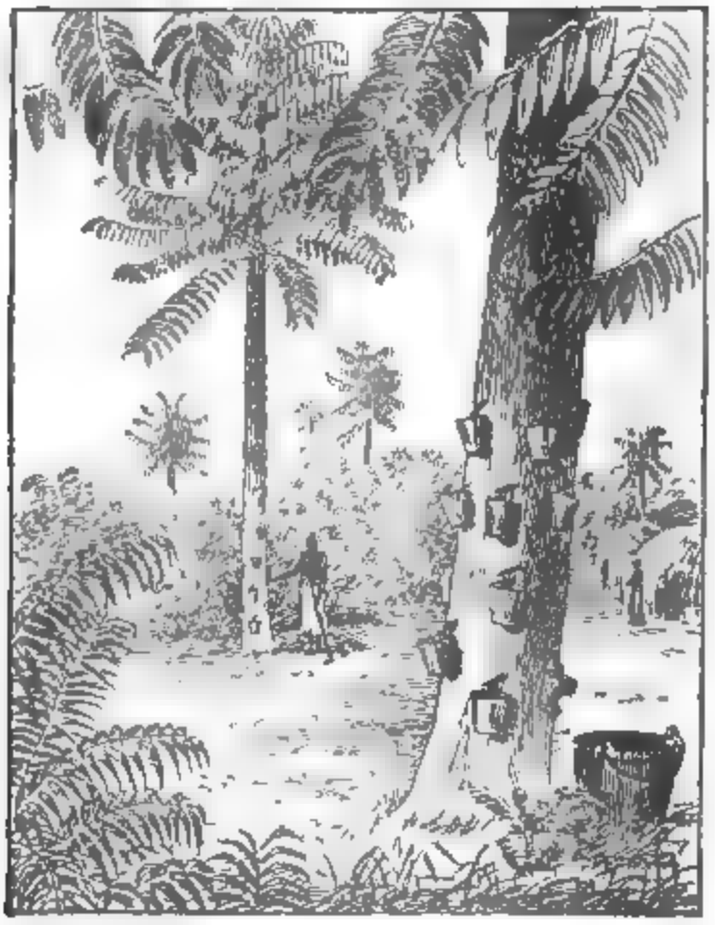
With regard to the saving of time, I found that the greatest waste of it was caused by the necessity for beginning afresh with every new country, and for repeating over and over again great principles, *e.g.* the reasons for the growth of towns. In other words, the boys could not make full use of physical and geological maps because they had not the necessary knowledge of principles. Practical experiment proved, however, that a whole term "wasted" on the great phenomena of the science and on the chief necessaries of life, was amply repaid when we came to deal with the earth piecemeal by continents and countries. And it is the result of this experiment with my own classes that is embodied in *Man on the Earth* and *Man and his Markets*

This substratum of knowledge enabled us to understand the atlas, to argue constantly by cause and effect, and to apply known conditions instantaneously to new cases. It also involved us in constant verification of facts, and in constant appeals to observation.

Of course, it is absolutely essential to do such work in close connection with the atlas; and, in view of this, care has been taken to mention very few places which will not be found even on the cheapest atlas; *e.g.* "The Satchel," or Keith-Johnston's "Sixpenny" A wall-map is certainly very useful, especially a really large *Mercator*; but I have come to the conclusion that the most satisfactory results are obtained when every member of every class has an atlas of his own. Then every place can be looked out by every one every time that it is mentioned; and, if this is done carefully and constantly, names and positions come to be remembered with great ease and accuracy.

[SPECIMEN PAGE]

Moreover, as the Andes run down the west coast, while the wet winds blow—except in the south of Chile—from the east, the **great rivers** flow from the eastern slope of the mountains towards the Atlantic, *i.e.* towards the commercial nations of the Old World. And the existence of two mountainous plateaux, that



COLLECTING RUBBER.

of Guiana in the north and that of Brazil in the east, divides the river system into three great basins—the Orinoco, the Amazon, and the Plate.

Between these three mountain systems, and along these three rivers, there are **three plains**—the llanos of the Orinoco, the selvas of the Amazon, and the pampas

i.e. in Flanders. It happens also that in the same district there is a remarkable absence in the soil of limesalts; and this makes the water of the Lys river peculiarly well adapted to the cleansing of flax, just as the water of the Maine (U.S.A.) rivers is to the manufacture of pulp and paper, or that of the Loire at St. Etienne to the tempering of iron, or that of the Trent at Burton to the brewing of beer. Consequently, the wealth of the Flemish peasant consists chiefly in flax; and, owing to the abundance of coal and iron in the neighbourhood between Tournai and Liège, Courtrai and other towns in the Lys valley have become as famous for fine linen as Brussels, Mechlin, and Bruges have for fine lace.

What has been said about the climate of Belgium is more or less true of **Holland**. The country is very low and very flat, and is exposed on the north, as well as on the west, to wet sea-winds. Consequently, the air is very damp, and the sky is continually clouded over; but there is no effective condensing medium to precipitate the moisture in rain or snow.

In such a climate, and on an alluvial soil, the agricultural products are sure to include rye, potatoes, and flax; and the demand for really good flax for the Belgian lace industry causes a single crop of it to be sometimes more valuable than the whole piece of land on which it was grown. But the most important product of all will be **grass**, for the low moist polders give splendid pasture for the production of milk; and dairy industries suit a country like Holland, which has very important colonies, *e.g.* in Java, Sumatra, Borneo, and Guiana, to attract its male population to commerce. The cheese is made chiefly west of the Zuider Zee, *e.g.* at Alkmaar, and Hoorn,

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did not think *losses* were so "interesting" as *gains;* and who did not therefore "interest" themselves sufficiently about them, to prevent their running away with all the gains! How vexatious it must be for a man who is doing a good trade, quite enough perhaps to get a very comfortable living out of it, to find at the end of the year, that the greater portion of his "profits" are being ***eaten up*** (so to speak) by "losses."

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2. Bad Debts.
3. Discounts.

I do not mean to say that these are the only three, but they are the most common, and will be enough for the present to think of. Of these the *first* is the largest, and can the most easily be reduced.

[SPECIMEN PAGE]

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The *practice* of the *art* is best learnt afterwards. The study of the Theory should be taught at school, and taught to every boy and girl; not only on account of its intrinsic importance, but because, if handled properly, it can be, and ought to be, an instrument of no mean educational value

This it could never become by the old method of teaching the subject, which was characterized mainly by four glaring faults:

(1) It *began* wrong—taking Day Book and Invoice Book first, and Ledger last. De Morgan vigorously hits this blot: "The only book that need be explained," says he, "is the Ledger. The other books have nothing to do with the main principle."

(2) It laboured with intense assiduity to guide the pupil into well prepared RUTS. Make your entries thus—and thus—and thus, and on no account deviate.

(3) It carefully *obscured* the principle by a wholly needless multiplicity of details.

(4) A KEY was usually incorporated with the text-book; the pupil being pathetically asked not to refer to it unnecessarily.

This Primer avoids these errors in the following manner:—

(1) The *first* half of the book deals with the Ledger, and how to prove it.

(2) Almost every account is shown in a variety of forms and the exercises are worked out in different ways, in order to throw the pupil back on himself at every turn.

(3) Technical phrases are avoided as much as possible. Shillings and pence, folios, and even dates are banished from very many of the exercises.

(4) Little progress will be made by the pupil until he understands how to find out and correct his own mistakes. A chapter is therefore given on Error Hunting—a matter that need not be considered dry and uninteresting if properly approached.

OPINIONS OF THE PRESS

The Leeds Mercury says: "Clearness and common sense alike distinguish Mr. Thornton's useful little *Primer of Book-keeping*. The object of the volume is to help boys at school to grasp intelligently the theory of the art, so that when in the business of after life they are confronted by its practice they may experience no real difficulty. The first half of the book deals with the ledger and how to prove it, and the exercises which follow are worked out in a variety of forms so as to throw the pupil on his own resources whenever that can be fairly done. Technical phrases, we are glad to see, are avoided as far as possible, and the exercises are, of course, carefully graduated."

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The **Schoolmaster** says: "This *Primer of Book-keeping* is a work that will please many who are engaged in teaching this valuable subject. It is interesting from its clear, graphic description of book-keeping, and all 'who are not infants or lunatics' ought to come away from the book far better acquainted with the art than when they first went to it. . . . The 'Key' is a useful aid to the exercises in the Primer."

The **Practical Teacher** says: "This *Primer of Book-keeping* is not a whit behind any of its predecessors. It is written mostly in the first person singular, and has almost the value of *vivâ voce* lessons. Its purpose is to enable pupils to understand the principles of book-keeping. The method adopted in the book is analytic instead of synthetic. . . . As every child who leaves school ought to know something of accounts a book of theory and practice is needed, and we have not yet met with a little book which will serve the purpose better than this shilling Primer."

The **Manchester Guardian** says: "This excellent little book is admirably adapted for the purpose. The methods of recording accounts are very clearly and simply explained, and frequent exercises are prescribed, these being sometimes supplemented by questions which the pupil may put to himself with a view to ascertain how far he has grasped the instruction previously given."

The **Glasgow Herald** says: "This *Primer of Book-keeping* is a useful addition to the well-known Primer Series of this firm by Mr. J. Thornton, an author already recognized as an authoritative exponent of the subject. The present manual, which is of about equal compass with the other primers, contains an admirably simple statement of the principles of account-keeping. There is a directness and lucidity in the language employed which persons of ordinary understanding and application can hardly fail to comprehend."

Education says: "It puts the essentials in the clearest way."

The **Cape Argus** says: "The book is a model of clearness."

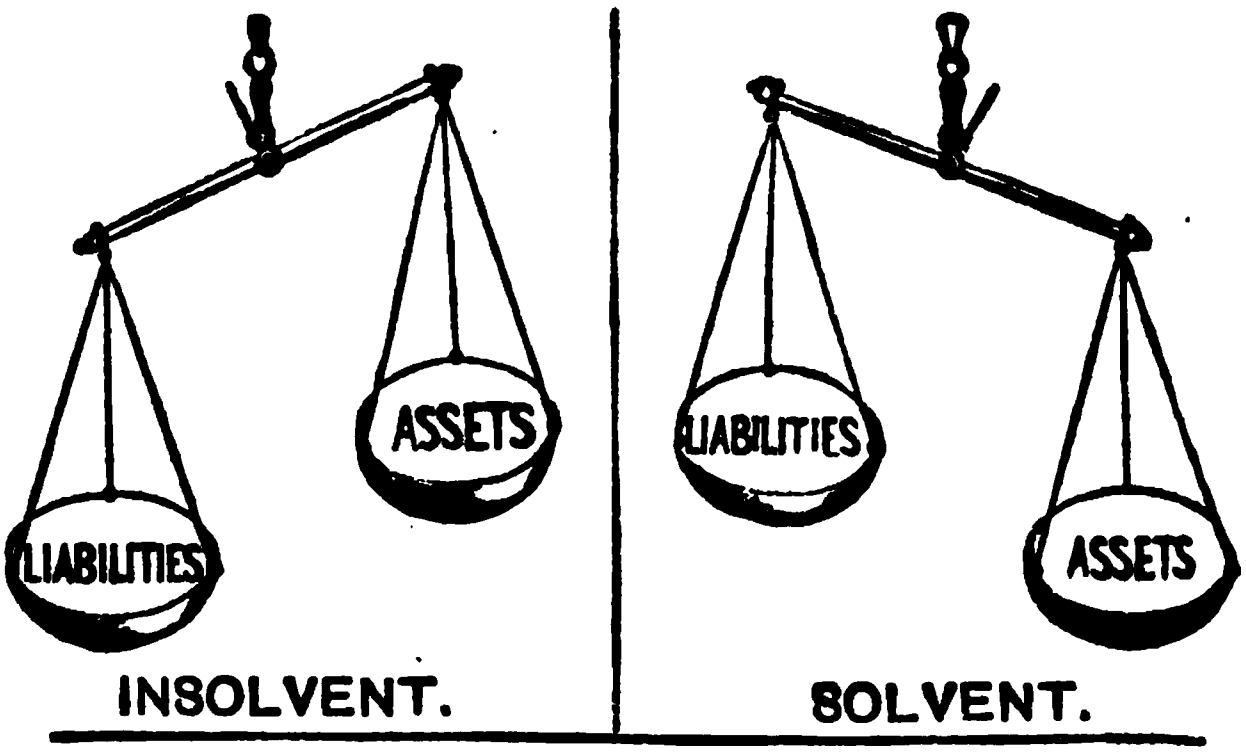
The Manuscript Exercise-books for the Primer are now published by Messrs Macmillan & Co. Price 1s., *the set.* *See page* 624.)

A statement made out in this way is called a Balance Sheet.

[10] When a man is NOT in a position to be able to pay all his debts (even though he sold all his goods and collected all the money owed to him to enable him to do so), then he is said to be "*Insolvent.*" You may say then—

(1) *I am* "SOLVENT" *when my* "*Assets*" *exceed my* "*Liabilities.*"

(2) *I am* "INSOLVENT" *when my* "*Liabilities*" *exceed my* "*Assets.*"



[11] By looking at a Balance Sheet I can not only see whether I am Solvent or Insolvent, I can also find an answer to some other very important questions. It would seem then that the Balance Sheet is the store-house of much of that Useful Information which it is the very aim of good Book-keeping to supply. It is not only that It is more. It is the "Alpha and Omega" (the beginning and the end) of Book-keeping. For the *first* thing to do on taking a Business, and the *last* thing before

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[*For specimen see page* 624.)

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This book of *Easy Exercises* is a great favourite of my own. I use it in all my elementary classes, and find it very useful for mid-term examination and revision purposes. One glance at the table of contents, and the several divisions of a class may be immediately set to work (useful work) by the mere announcement of the numbers. Quite recently I prepared a class of seven for the Cambridge Junior Locals largely by the aid of this book. [They had been nourished on First Lessons.] Five of them gained the mark of distinction, one of these being placed First in the list.

I have not thought it necessary to issue a Key, as *Answers* are given pretty fully at the end of the book.

For Manuscript Exercise books I recommend the use of any of those numbered* 1, 2, 3 *and* 6 (*see page* 624.) *I find the occasional substitution of loose sheets of paper an advantage

Practical Teacher.—"These Exercises are eminently practical. . . . The common-sense views, the short, crisp sentences in which directions are given, the genial manner in which difficulties are explained, the unconventional illustrations, bespeak the attention of the learner, and prove the author to be a master of his subject, a teacher full of resource and endowed with the *bonhomie* of a happy enthusiast."

Notes.

This Exercise is to be worked out like the last one. The first entry is not a "Transaction" at all. If you do not remember where to enter it look at the last Exercise. Remember that each Transaction goes in *two* different Accounts, and on *opposite* sides, or you will have all your work for nothing. You will never Prove!

Exercise 62.

Enter the following Transactions in Skeleton Ledger. Then balance and "Prove," *as in the preceding Exercise, taking Value of Goods on hand at the end of the month at* £170.

1890.			£
Jan.	1.	Began business with . . .	600
	5.	Bought Goods for Cash . .	350
	10.	Sold Goods to J. Smith . .	120
	15.	„ „ to J. Brown . .	50
	20.	„ „ for Cash . . .	60
	25.	Received of Mr. Smith . .	100
	30.	Paid Trade Expenses . . (Debit Profit and Loss) .	25

Questions.

1. What was I worth at the beginning of the month?
2. What was I worth at the end of the month?
3. What is Gross Profit?
4. How much Gross Profit did I make in January?
5. How much *Net* Profit?
6. Could Net Profit possibly be equal to Gross Profit? If so, explain how?

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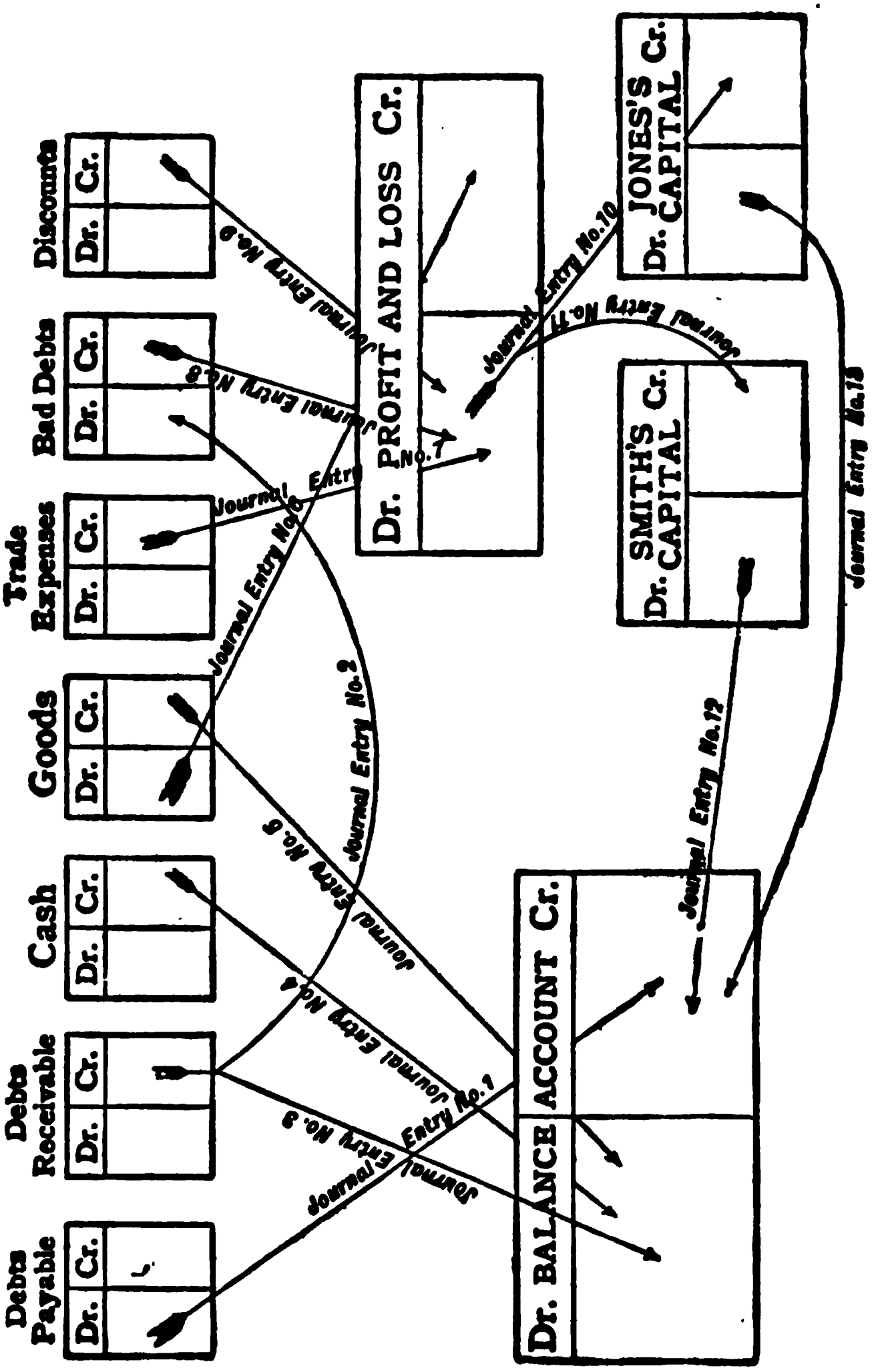

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(2) By contracting some words.
(3) By putting the last word just above or below the line.

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6.—Set Units exactly under units.
Tens exactly under tens.
Hundreds exactly under hundreds.

7.—Let the tens figure of your pounds always stand in the *middle* of the pounds column.

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THE principles of good Book-keeping are extremely simple, though their application is often very far from being so.

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The chief defects of many manuals of this kind seem to be (1) the paucity and cloudiness of the explanatory matter and (2) the want of elasticity of the "model system" set forth as an example.

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The set of account books in which these transactions are recorded is so far from being regarded as a model set, that alternative methods are suggested at every step, and set forth at length in the appendix.

A Trial Balance is taken at the end of every week, both members of the firm assisting in the work. A full and final balance is struck at the end of the month, the result being readily arrived at and clearly set forth by the use of the ABC Automatic Balancing Chart.

It is hoped that the partnership thus begun may be made permanent by the regular use of these charts.[1]

In the preparation of this guide, and more particularly in the arrangement of the transactions and construction of the books of Reader and Thornton, I have gladly availed myself of the assistance of my son, Mr. S. W. Thornton, without whose help the pressure of other work would I fear have led to the indefinite postponement of its publication.

J. THORNTON.

LEAMINGTON COLLEGIATE SCHOOL.

[1] The Automatic Balancing Charts may be obtained from any bookseller through the publishers of this handbook.

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In the Journal the primary entry of each transaction must first be made. Then, using the Journal as a guide, the Ledger must be posted up.

It is not imperative to use the Ledger Index, but it is desirable to follow the commercial practice of indexing each account opened.

The Journal "narrations" should be written out in full, and the "particulars" of each transaction should be inserted in the proper columns of the Ledger, in all cases where the entry would not be intelligible without them. If pressed for time, in answering a long examination paper, the student may, however, be compelled to omit these important details.

The Trial Balance before Closing, and the List of Balances after Closing, are in practice made out on loose sheets of paper, but in order to render this set of Exercise Books as compact and portable as possible, the necessary forms are here included at the end of the Journal. A form for the Balance Sheet will be found on the back of the Ledger.

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All Bank and Office Cash transactions, with the Discount items relating thereto, are entered direct into the Cash Book, and thence posted into the Ledger.

Transactions which do not involve any cash receipts or payments are first entered in the Journal, and thence posted into the Ledger. All purchases and sales can be treated in the same way; they are so few in number, in an exercise of the length usually set, that there is no object (unless by special direction of the examiner) in having a separate Purchase Book and Sale Book for their primary entry. The Journal can also be used for bill transactions, thus obviating the necessity for separate Bill Books.

It is not imperative to use the Ledger Index, but it is desirable to follow the commercial practice of indexing each account opened.

The Journal "narrations" should be written out in full, and the "particulars" of each transaction should be inserted in the proper columns of the Cash Book and Ledger, in all cases where the entry would not be intelligible withou them. If pressed for time, in answering a long examination paper, the student, may, however, be compelled to omit these important details.

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[SPECIMEN PAGE]

coal-fields in Lanark and Ayr. In the *United States* Pennsylvania is the great home of the iron-smelting industry. Pittsburg is the great iron town. In *Germany* iron-smelting is carried on most importantly in the Ruhr valley.

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The chief exporting country is the *United Kingdom.* Its exports have varied considerably during the last few years owing to the renewed efforts of the United States to close its markets to our goods. In 1890 the value of these iron exports was £31,000,000; of these, the great mass goes to the British Colonies, India, Canada, and Australia. In the case of railway plant and steel rails, the Argentine and Brazil are very large purchasers from England. Owing to its large foreign trade in iron and steel goods, there is a large import of iron ore, of which nearly all comes from Spain. It enters at the south Welsh ports and at Newcastle and Glasgow, and is smelted with the coal from the neighbouring pits. *Germany* exports an increasing amount of iron and steel goods, and imports more pig-iron than it exports. *France* imports iron ore, and is able to send abroad its surplus products both in manufacture and pig-iron. The *United States*, despite its efforts to render itself independent of foreign supplies, and notwithstanding the extent of its iron production and manufacture, still continues to buy pig-iron and European iron and steel goods. This is owing to the rapid growth of its industries, and the necessity in which it stands of still further railway extension. *Belgium* imports regularly more iron ore and pig-iron than it exports. On the other hand, its exports of iron goods are very considerable, falling not far short of half a million tons in quantity. As a

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Der Inhalt begreift (comprises) das, was zu ſchreiben iſt. Sind mehrere Briefe zu beantworten (if there are . . .), ſo geſchieht dies Ihren Daten nach (this is done in order of date); man beſchränkt ſich jedoch (confining oneself, however) auf das, was wirklich einer Antwort oder Erwähnung (mention) bedarf. Hat man keinen Brief zu antworten, ſo muß man ſich auf denjenigen berufen (refer), der dem zu ſchreibenden vorangegangen iſt (which preceded the one to be written), und auf den wichtigſten Teil ſeines Inhalts aufmerkſam machen.

B. Der Schluß des Briefes enthält je nach den Umſtänden einige verbindliche Worte (words of compliment) an denjenigen, an welchen man ihn richtet: einen Wunſch, der auf Herſtellung (the establishing) eines lebhaften Verkehrs gerichtet iſt; die Bitte, Aufträge zu erteilen, oder über die Dienſte des Schreibers bei jeder Gelegenheit zu verfügen; wohl (maybe) auch die Bitte, einen dem Schreiben beigelegten (enclosed) Brief an jemanden übergeben zu laſſen oder zu befördern. Dann kommt das Schlußcompliment (complimentary conclusion). Dasſelbe iſt von Kaufleuten zu Kaufleuten in der Regel (as a rule) ganz einfach (simple), z. B. Achtungsvoll ergeben—Achtungsvoll und ergebenſt—Mit Achtung und Ergebenheit—Ich empfehle mich Ihnen ergebenſt (mit Achtung und Ergebenheit)—Ich zeichne mit Achtung und Ergebenheit, u.s.w.

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2. *Hemos recibido oportunamente su carta del 5 de enero . . .*	We have received in good time your letter of Jan. 5th . . .
3. *Es en nuestro poder su carta del 25 del mes pasado en la que . . .*	We are in possession of your letter of the 25th ult., in which . . .
4. *Tenemos el honor de advertir á Vd. . . .*	We have the honour to inform you . . .
5. *Nos hará V. un gran servicio, si le es posible darnos informes sobre la casa . . .*	You will do us great service if you can give us some information about the firm . . .
6. *Confirmando á V. nuestra última, tenemos el honor . . .*	In confirmation of our last, we have the honour . . .
7. *Hemos recibido la favorecida de Vd. del 17 del corriente . . .*	We have received your favour of the 17th inst. . . .
8. *A mi llegada en Madrid he recibido la carta que se ha servido á V. dirigirnos el 17 del corriente.*	On my arrival in Madrid I received the letter which you were so good as to send us on the 17th inst. . . .
9. *En contestacion á su estimada del 20 del mes ultimo . . .*	In answer to your favour of the 20th ult. . . .

N.B.—The tendency of the present day is to avoid complicated and over-polite formulæ. It may be said that the conciseness of the English commercial style is daily more appreciated by Spanish business men.

Endings of Letters

1. *Con este motivo tengo el honor . . .*	I have the honour to subscribe myself . . .
2. *Quedan de Vds. afectísimos seguros servidores;* generally written, *Quedan de Vds. Afos S.S.*	Equivalent to, Your obedient servants.

A more respectful and now not very commonly used ending is the following:—

3. *Permítanos V. le ofrezcamos la consideracion mas perfecta de sus atentos servidores.*	Literally, Permit us to offer you the most perfect consideration of your attentive servants. Equivalent to, Your most obedient servants.

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[SPECIMEN PAGE]

shipowner for stowage. In some cases the charterer stows the cargo at the shipowner's risk and expense. Mats or other articles used to protect the cargo from the bottom and sides of the vessel are called "dunnage" (clause *j*).

§ 212. Consignment of Vessel.—The parties usually agree on some firm or person who is to act as agent for both the owners of the vessel and of the cargo in the ports to which the vessel proceeds. Sometimes the vessel is consigned to the charterers' agent, and the amount of commission to be paid such agent ought to be fixed by the charter-party (clause *k*).

§ 213. Brokerage.—On the signing of a charter-party, a commission is usually paid to the brokers who negotiate the charter-party. The amount is fixed by the charter-party (clause *l*).

§ 214. Perils Excepted.—The shipowner is liable, as we have seen, for any damage arising to the goods on the voyage. A charter-party usually excepts damage arising from "restraints of princes and rulers, the dangers and accidents of the seas, fire, pirates, and enemies," etc., and often makes provision for the case of war (clause *o*). The perils usually excepted will be discussed later on (§ 226).

§ 215. Provision in Case of War.—If war breaks out between the country to which a vessel belongs and a foreign state, the vessel is liable to capture. Hence if there is a probability of war, provision is often made for cancelling the charter-party (clause *p*).

§ 216. Additional Clauses.—Clauses are often inserted providing for arbitration in case of any dispute between the parties (clause *m*), for the payment of a fixed sum in case the charterers withdraw from the contract, and for cancelling the contract where misrepresentations as to the size or state of the vessel have been made by the owners.

Bills of Lading

§ 217. Definition.—A bill of lading is a receipt for goods shipped in a vessel signed by the person who

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ship lit up the sky, and he could see men clinging to bits of masts or planks, and boats full of men trying to get away from some sinking ship.

CASABIANCA.

11. On the *Orient* they kept a great deal of powder, and suddenly Casabianca heard the dreadful cry, "The ship is on fire."

And after him a familiar lass
Did shine like glittering gold.

"THEN FOUR-AND-TWENTY BOWMEN BOLD
CAME LEAPING O'ER THE LEA."

17. "This is not a fit match," quoth Robin Hood,
"That you do seem to make here;
For since we are come unto the church,

II.—THE ROMANS

8. Who the Romans were

1. Now we must leave these stories, and go back again for a moment to the Aryans who lived in the far-away plain. All the while that the Celts had been wandering towards the west, and settling in Britain, the Aryans still kept on growing in numbers; so that every now and then fresh bodies of them had left to seek their fortunes elsewhere.

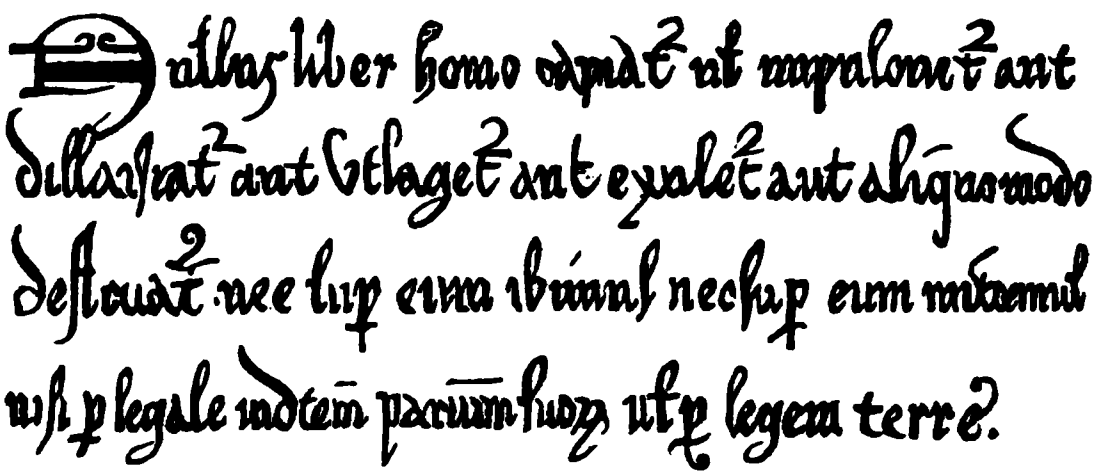
2. Those who started next after the Celts, instead of going always westward, turned more to the left hand, that is, to the south; and at last made their home in the country which we call Italy.

3. These people came to be known as Latins; and the curious thing about them is, that while the Celts, in their country near the ocean, and in the island of Britain, seemed to fall back into a state of half-savage life, the Latins, on the other hand, kept on improving.

4. They built a splendid city, called Rome, which very soon became the "Mistress of the World." This means that the men who lived in the city were so brave and clever, that they were able to conquer nearly every other nation.

no doubt it is. But if you try to understand something about it, you will find it very interesting—in fact one of the most interesting things that there are in the world. Let us think again what it all means.

4. King John was ruling very badly. In the first place he had sold the whole of England to the Pope, so that it could no longer be called a free country. Then people's lives were not safe,



CLAUSE FROM MAGNA CHARTA.

any more than their property was. The King would shut them up in prison, or seize all their lands and goods whenever he chose to do so, and they had no means of getting redress.

5. Besides this, he was always wanting money, and taxed everybody heavily. It was not as in Richard's reign, when the King had neglected the country and left it to his advisers to administer.

6. Then the Government had been carefully carried on. But now John actively interfered,

out walking near her palace at Greenwich, with some of her attendants, when they reached a part of the

SIR WALTER RALEIGH.

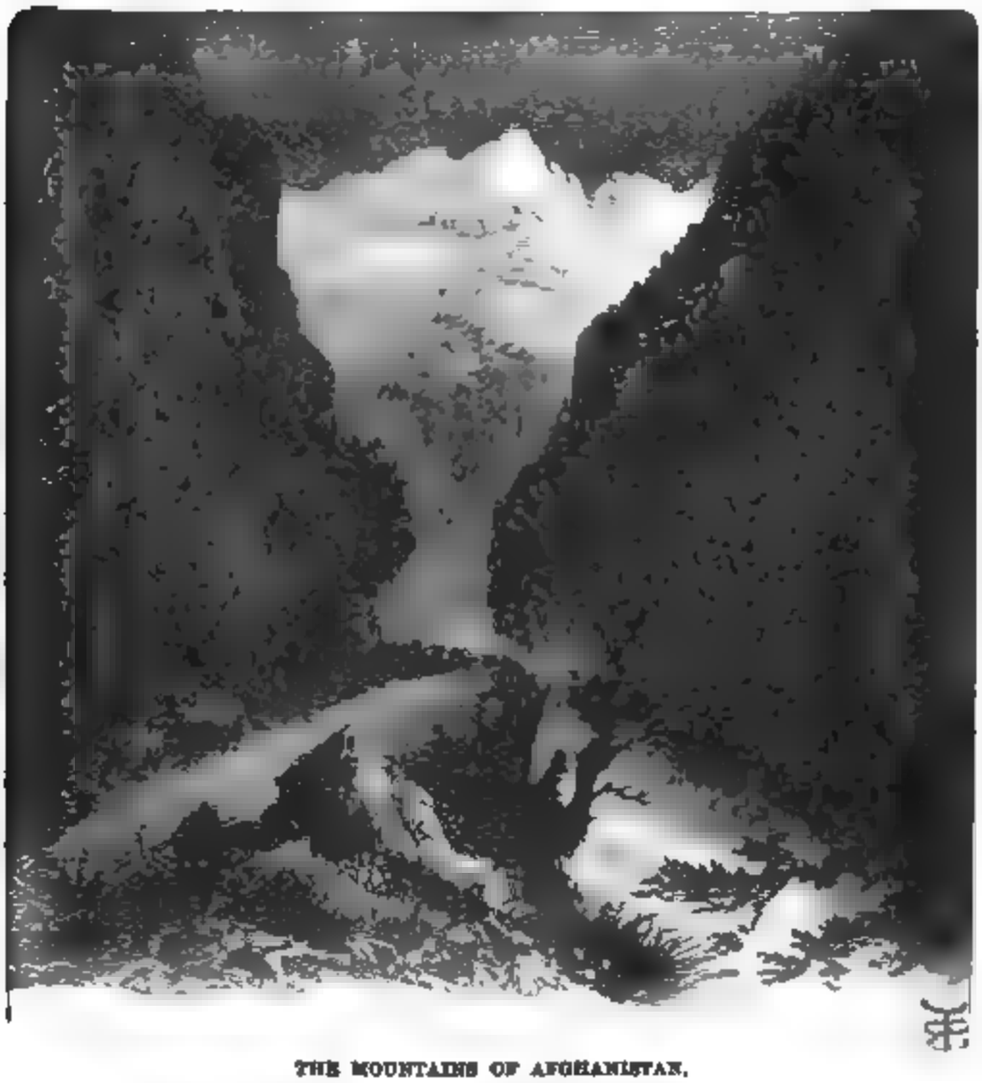
road which was wet and miry. The Queen stepped back for fear of soiling her beautiful shoes, and Raleigh, who was near, instantly took off a costly velvet cloak

he promised to govern according to law, and to pardon those who submitted to him in forty days.

7. The Declaration was received with delight, and on the 25th May Charles landed at Dover. Four days later he entered London, amidst universal rejoicing, except on the part of the army. But it was impossible even for them to withstand the wishes of the whole nation, who by this time were thoroughly tired of Puritan restrictions. In this way the great Rebellion came to an end.

EMBARKATION OF CHARLES II.

5. The army was in this dreadful state when it arrived at the entrance to the Coord Cabul defile. It is five miles in length, and bounded on either side with steep overhanging mountains. It is so narrow



THE MOUNTAINS OF AFGHANISTAN.

the sun never penetrates its gloomy jaws; there is barely room for a rugged road or horse-track between the torrent and the precipices. The stream dashes down the whole way with inconceivable impetuosity, and requires to be crossed eight-and-twenty times in the

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The other events in the reign of Charles II. must be left for another book. Here we can only

THE MONUMENT.

say that, after leading a gay life, for he was known as the Merry Monarch, he died a member of the Church of Rome in 1685.

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his own tenants; while in 1198 the successful opposition of St. Hugh of Lincoln proved that the clergy regarded the military service of their lands as being limited to England. The whole position, moreover, was entirely altered when John, in 1204, lost his foreign territory. In 1213 John nevertheless determined to attack Philip Augustus, and called on the barons to follow him. They refused, and he renewed his demand. The northern barons declared that their tenure did not exist beyond the serving in England, the first instance known of lay opposition. John marched against the northerners, who all along took the lead in this stand against the king, but his effort was useless. The justiciar attempted to conciliate the south; and at St. Albans it was promised that there should be better government. Stephen Langton, at a council at St. Paul's, produced an original charter of Henry the First, and demanded its confirmation. Just at that juncture FitzPeter died, a great blow for John, though at the time he did not realize it. Peter de Roche, the Bishop of Winchester, was then appointed in FitzPeter's stead.

42. John was weak in two ways. He failed to revive the alliance between the crown and the church, in spite of the reconciliation with the papacy; so that Stephen Langton, who refused to follow the guidance of Innocent III., became the great leader of the opposition to the king. Secondly, he forced the barons to rely upon the people. As John had treated the barons who opposed him, so he had let his friends among them treat the people. It was impossible to long delay the end. A charter to the churches was granted in 1214, but it was too late to be of much use. In the following year the barons formulated their demands, and John held out until London opened to them. Then, in June, 1215, he signed *Magna Carta.*

Magna Carta.

43. Six of its clauses are of great constitutional importance—numbers 12, 14, 15, 39, 40, and 61. In No. 12 it is declared that no scutage or aid was to be imposed but with the consent of the council, except for the king's ransom, the knighting of his son, or the marriage of his daughter; and

effect that no Papist should ever again hold the crown of England. The conditions were put before William and Mary, and the crown was offered to them, "which," William said, "we thankfully accept." It should be noticed that in neither of the great charters secured by the nation under the Stuarts (the Petition of Right and the Bill of Rights) is any claim made on behalf of the people for liberties and privileges other than they had enjoyed from time immemorial. Nor was a claim even in *Magna Carta* (1215) for anything new. What these documents all insisted upon was the abolition of the additions to the prerogative of which the nation had reason to complain. The legal prerogatives of the crown were by all of them left untouched. The nation required no more than its customary rights.

SUMMARY.

(1) THE TORY REVIVAL CONTINUED (1685). James kept on Charles's Tory ministers and declared he would maintain the constitution in Church and State. **May**, *Tory Parliament* met, gave James a large revenue for life, and released Danby. *Unsuccessful Whig risings* under *Argyll* in Scotland and *Monmouth* in the west of England. **July 6**, *battle of Sedgemoor*. Chief-Justice Jefferies carried out the *Bloody Assize*. James at the height of his power.

(2) THE PROJECTED CATHOLIC RESTORATION (1685-1688). James dismissed Parliament for refusing to repeal the Test Act, and turned Halifax out of office. **1686**, James got a judicial decision (*Hales's Case*) that he could, through his *dispensing* and *suspending powers*, override the laws, and appointed many Catholics to posts in Church and State, set up a new *Ecclesiastical Commission*, and collected a *Camp at Hounslow* to frighten London. **1687**, a papal nuncio received. The fellows of *Magdalen College, Oxford*, deprived for resisting a Romanist president. **1688, April**, James issued a *Declaration of Indulgence*. Archbishop Sancroft and six bishops protest. **June 10**, birth of James, Prince of Wales. **June 30**, *acquittal* of the *Seven Bishops*, and an invitation sent to William of Orange to protect the liberties of England. **Sept. 30**, William III. issued a declaration that he would come to England and secure a free Parliament. **Nov. 5**, William landed at Torbay. General defection from James. **Dec. 19**, William reached London. **Dec. 23**, James escaped to France. **1689, Jan. 22**, a **Convention** assembled, declared the throne vacant, drew up the **Declaration of Right** and *Act of Settlement*. **Feb. 13**, William and Mary offered and accepted the throne.

for himself. He had had no objection to the constitutional theory that the Foreign Secretary must be under the control of the Crown and Prime Minister. What he did object to was that he should be the Foreign Secretary so controlled. Now that he was Prime Minister the objection was removed, and for the last six years of the Prince Consort's life, he and Palmerston worked well and cordially together.

The last years of the Prince Consort.

11. The power of the Prince lay in the faculty which he possessed for impressing all those with whom he came in contact. Of his absolute sincerity of purpose there could be no doubt in the mind of whatsoever man happened to approach him. This, and the singular purity of his life, were the two strong bases upon which his character rested. From many points of view, however, he was not genuinely in touch with the average English character; and although those who knew him best liked him best, there was much in him which the average Englishman could not understand. The Queen had readily yielded herself to his remarkable qualities, and every one who had any personal dealings with him experienced a similar feeling. Sir Robert Peel has recorded the impression that was made upon him, and Lord John Russell and Lord Aberdeen were equally moved by his gravity and his sincerity. The effect that the Prince was thus able to make upon successive prime ministers was obviously visible to many politicians who were not within the personal sphere of the Prince's influence. Among men of this kind it was complained that there was a "power behind the throne," and it did not need much to make this cry degenerate into an open assertion that the Prince's influence was exercised in a manner hostile to England. It was impossible, so the tongues of the malevolent ran, for a prince to be closely allied to foreign states and princes, and not to use his influence on their behalf. In January 1854 these scandals came to a head, and ended in a scene in the House of Commons, when all those who had held the office of Prime Minister since the Queen's marriage spoke in the highest terms of his constitutional actions, and

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EXTRACT FROM PREFACE

In republishing this book, written many years ago for children, I have tried to make it suitable for somewhat older readers than those to whom it was at first addressed. It is still intended for young people who have no previous knowledge of the subject, but it is supposed that they will be of an age when proper names, dates, and tables of events are looked upon as helps, not hindrances, to the matter in hand.

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GERMANY.	EASTERN, SOUTHERN, & NORTHERN EUROPE.
1763. Peace of Hubertsburg between Prussia and Austria (Feb. 10) :— (1) The restoration of the *status quo*—Austria restoring Glatz, and Frederick evacuating Saxony. (2) By a secret article Frederick agreed to support the election of the Archduke Joseph as King of the Romans.	**1763.** Peace of Paris between Spain and England (Feb. 10) :— (1) Spain recovered the Philippines and exchanged Florida for Havana. (2) Spain recovered Louisiana from France. (3) England gained the right of cutting logwood in Honduras. Peace is made between Spain and Portugal (Feb. 10). Death of Augustus III of Poland (Oct. 3).
1764. Death of Harrach, President of the Austrian Council of War (1738–1764). A defensive alliance is made between Prussia and Russia (April 11) to guarantee the existing constitutions of Poland and Sweden, to control the election to the Polish throne, and to protect the Polish Dissidents. The Archduke Joseph is elected King of the Romans, the Prussian opposition being withdrawn.	**1764.** Stanislaus Poniatowski, the nephew of the Czartoryski, and the protégé of Russia, was elected King of Poland (Sept. 7).
1765. Death of the Emperor Francis (August 18).	**1765.** Death of Don Philip of Parma. Du Tillot governs Parma during the minority of Ferdinand, and carries out reforms. The Archduke Leopold begins his government of Tuscany.
JOSEPH II, 1765–1790. Married (1) Isabella of Parma. (2) Maria Josepha, daughter of the Elector of Bavaria, the Emperor Charles VII.	
1766. Prussia, with Russia, interferes in Poland on behalf of the Dissidents.	**1766.** D'Aranda succeeds Squillacci, who is dismissed by Charles III. Christian VII, whose wife was a sister of George III, succeeds Frederick V on the Danish throne. William V of Holland begins to rule. Dismissal of Squillacci, owing to riots in Spain.

ENGLAND.	FRANCE.
1763. By the Peace of Paris with France and Spain, England secured (1) St. Vincent, Tobago, Dominica, Grenada, Senegal, Minorca, and the Grenadines, (2) Canada, (3) Florida. Bute is succeeded by Grenville (April), whose Cabinet included Halifax, Egremont, Shelburne, Sandwich, and Gower. Wilkes is attacked and becomes notorious. The Bedford section join the Government (Sept.), and Shelburne retires.	**1763.** Peace of Paris (Feb. 10) between England and France:— (1) France loses Canada, Nova Scotia, and Cape Breton, and the Mississippi becomes the boundary between the English and the French. (2) France retained certain fishing rights off Newfoundland and in the Gulf of St. Lawrence. (3) France regains Martinique, Guadaloupe and St. Lucia—the English kept Grenada, the Grenadines, Tobago, Dominica, and St. Vincent. (4) Goree was restored to France, and Senegal given to the English. (5) French settlements in India were restored, but no French fortifications permitted. (6) France gave up Minorca in exchange for Belleisle. (7) France and England to retire from the German war. A royal Declaration establishes the freedom of the corn trade in France (May 25). Choiseul-Praslin is Minister of Foreign Affairs from 1763 to 1766.
1764. Expulsion of Wilkes from the House of Commons (Jan. 19) for having written a seditious libel.	**1764.** Death of Madame de Pompadour. Suppression of the Jesuits in France (Nov. 26).
1765. The Stamp Act is passed (Mar. 10). Burke enters Parliament. Discussions on a Regency Bill alienate the King from his Ministers, and the Rockingham Ministry succeeds that of Grenville (July).	**1765.** Death of the Dauphin (Dec.). His son (Louis XVI) becomes heir to the throne.
1766. The Stamp Act is repealed (Feb. 21), and general warrants are declared illegal. A Declaratory Act is passed, declaring England's right to tax America. Fall of the Rockingham Ministry (July). The Pitt-Grafton Ministry succeeds it. An English force occupies the Falkland Islands.	**1766.** Choiseul again became Minister of Foreign Affairs, remaining also Minister of War; and Choiseul-Praslin takes over the Marine. Lorraine falls to the French Crown on the death of Stanislaus Leszczynski. Louis XV attacks the *Parlement* of Paris, and declares that the sovereign power resides in himself (March). An Order of Council orders the observance of the Gallican maxims of 1682, and repeals the Order of 1731 for silence.

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PREFACE

PROBABLY few whose duty it is to teach Roman history in schools will deny that some such work as the present has too long been needed. It is for men thus engaged to judge whether this book meets their need. It would be alike impertinent and superfluous to dilate on the merits of Professor Mommsen's history: those merits have won recognition from all qualified judges, and have long established his position as the

prince of Roman historians. Unfortunately the size of his history is beyond the compass of ordinary schoolboys; nay, possibly, others besides schoolboys have shrunk from attempting so formidable a task. Our abridgment of his history must of necessity give but a feeble and inadequate idea of the original; but something will have been accomplished if we have given some conception, however faint, of that original, and have induced fresh inquirers to read for themselves those pages so bright with wisdom and imagination. There has been no attempt to hold the balance between Professor Mommsen and his rival Ihne, nor to answer the criticisms of Professor Freeman. Such efforts, even if we had the ability to make them, would be manifestly out of place in such a work as this. Occasionally, indeed, conflicting views have been indicated in a note; and the authorities have been studied, but our text contains the views of Professor Mommsen. Whatever merits may belong to this work should be ascribed to another; we must be held responsible for its defects. Our object has been to present the salient points clearly, and as far as possible, to escape dulness, the Nemesis of the abridger. Consequently we have tried to avoid writing down to a boy's level, a process invariably resented by the boy himself. Inverted commas indicate that the passage is directly taken from the original. The requirements of space have necessitated the omission of a special chapter on Literature, Art, Religion, Economy, etc.; nor have we thought it wise to insert a few maps or illustrations of coins, works of art, etc. An atlas is really indispensable, and one is, we believe, shortly to be published specially designed to illustrate this period. We have to express our great indebtedness to Professor Dickson for allowing us to make free use of his translation, the merits of which it would be difficult to overpraise. Our gratitude is also due to Mr. Fowler, of Lincoln College, Oxford, and to Mr. Matheson, of New College, Oxford. The former kindly revised the proof sheets of the chapter on Authorities, and gave valuable suggestions. The latter was good enough to revise all the proof sheets of the history, in the preparation of which we often found much assistance from his very useful "Outline of Roman History." We have also to thank Mr. H. E. Goldschmidt, of Fettes College, Edinburgh, for a careful revision of a large portion of the proofs.

While our history was in the press the third volume of Professor Mommsen's "Römisches Staatsrecht" appeared. Where possible, we have added references to it in our lists of authorities.

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BOOK FIRST—The Period Anterior to the Abolition of the Monarchy, Ch. I.-V.; BOOK SECOND—From the Abolition of the Monarchy in Rome to the Union of Italy, Ch. VI.-XI.; BOOK THIRD—From the Union of Italy to the Subjugation of Carthage and the Greek States, Ch. XII.-XVIII.; BOOK FOURTH—The Revolution, Ch. XIX.-XXVII. BOOK FIFTH—The Establishment of the Military Monarchy, Ch. XXVIII.-XXXVIII.

of the river Enipeus, which intersects the plain stretching southward from Larissa. Pompeius pitched his camp on the right bank, along the slope of Cynoscephalae. His entire army was assembled, and he had now eleven legions numbering 47,000 men and 7000 horse, while Caesar was still expecting two legions from Aetolia and Thessaly, and two which were arriving by way of Illyria from Italy; his eight legions did not number more than twenty-two thousand men and his cavalry but one thousand troopers. All military reasons urged Pompeius to fight soon, and the impatience of the emigrants had doubtless more weight than these reasons. The senators considered their triumph secure. Already there was strife about filling up Caesar's pontificate, and houses were hired in the Forum for the next elections. Great indignation was excited when Pompeius hesitated to cross the rivulet which separated the camps. He was only delaying the battle, they alleged, in order to perpetuate his part of Agamemnon and to rule the longer over so many noble lords. The general yielded, and prepared to attack. The battle-field was almost the same on which, a hundred and fifty years ago, the Romans had laid the foundation of their Eastern dominion. The right of the Pompeians rested on the Enipeus, Caesar's left upon the broken ground in front of the river. The other wings were both out in the plain, and each was covered by cavalry and light troops. The plan of Pompeius was to scatter with his cavalry the weak band of horsemen opposite to him, and then to take Caesar's right wing in the rear. But Caesar, foreseeing the rout of his cavalry, had stationed behind his right flank about two thousand of his best legionaries. As the enemy's cavalry galloped round the line, driving Caesar's horsemen before them, they were met and thrown into confusion by this unexpected infantry attack, and galloped from the field of battle.* This unexpected repulse of the cavalry raised the courage of the

* It was in this attack that the well-known direction of Caesar to his troops to strike at the faces of the enemy's horsemen was given. The infantry, acting in an irregular way against cavalry, were not to throw their pila, but to use them as spears, and, to be more effective, were to thrust at the faces of the troopers. It was probably the rough wit of the camp which suggested the idea that the Pompeian cavalry fled for fear of scars on their faces.

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EXTRACT FROM PREFACE

In determining the form and character of this book, I have been prompted by two convictions. One is that while, in writing a history based on the original authorities and from one's own personal point of view, it is natural and certainly easier to allow it to range into several volumes, its compression into a single volume often produces a more useful book. In the case of a new history of Greece, it seemed worth while to undertake the more laborious task. The other opinion which I venture to hold is this. So far as history is concerned, those books which are capable of enlisting the interest of mature readers seem to me to be best also for informing younger students. Therefore, while my aim is to help education, this book has in view a wider circle than those merely who are going through a course of school or university discipline.

It was a necessary consequence of the limitations of space which I imposed upon myself, that literature and art, philosophy and religion, should be touched upon only when they directly illustrate, or come into some specially intimate connexion with, the political history. It will be found that I have sometimes interpreted this rule liberally; but it is a rule which could be the more readily adopted as so many excellent works dealing with art, literature, and philosophy are now easily accessible. The interspersion, in a short political history, of a few unconnected chapters dealing, as they must deal, inadequately with art and literature seems useless and inartistic.

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Chronological Table; Notes and References; Index.

[SPECIMEN PAGE]

and a usurper had arisen, pretending to be the dead Smerdis, to whom he bore a remarkable likeness. Cambyses went in haste to crush the false Smerdis. But, as he passed through Syria, he "found death by his own hand," as is related in a great writing on the rock of Behistun. The next heir to the Persian throne was a certain Hystaspes, who was satrap of Parthia and had a son named Darius. But Hystaspes made no attempt to secure his right, and the false Smerdis established himself so firmly that, as Darius wrote afterwards in that famous inscription of the rock, "No Persian nor Mede dared to oppose him." But Darius had different thoughts from his father; and conspiring with six nobles he killed the usurper and became king himself. In the first years of his reign his force and ability were proved in the task of quelling rebellions which broke out in almost all parts of the wide realm which Cyrus had put together. Elam, Babylonia, Media, Armenia revolted; a new false Smerdis arose; Babylon had to be twice besieged. Having established his power firmly and crushed all resistance, Darius recorded for future ages the hardly won successes of his first years, in an inscription on the lofty rock of Behistun on the upper course of the river Choaspes. The writing is in the Persian, the Susic, and the Babylonian languages.

Accession of Darius (Dârajavahuš), 521 B.C.

(Babylon taken, (1) Feb. 520 B.C., (2) 519 B.C.)

Inscription of Bagistan.

By wedding Atossa, the daughter of Cyrus and widow of her brother Cambyses, Darius linked himself closely to the family of his predecessors. He proceeded to reorganise the administration of his dominion. He extended the system of satrapies or governments, and the whole realm was divided into twenty such satrapies. West of the Halys, the old kingdom of Lydia consisted of three provinces, but subject to two satraps: the Ionian and the Lydian under one governor who resided at Sardis; the Phrygian which included the Greek cities of the Propontis under a governor whose seat was at Dascylion. These satraps did not interfere in the local affairs of the Greek cities, which were ruled by despots; and the despots might do much as they pleased, so long as they paid tribute duly and furnished military contingents when required. The despots liked the Persian rule which secured their power, and this explains the noteworthy fact that the Greeks of Asia Minor made no attempt to shake off the Persian yoke during the troubles which ushered in the reign of Darius. It is possible too that their condition under the rule of Cambyses was better than under Darius; for Darius is said to have instituted a fixed yearly tribute instead of irregular contributions. Commerce, however, was furthered by this king's monetary reforms, and by his improvement of the road-system in Persia. He adopted the bimetallic coinage which Croesus had introduced in Lydia; and the chief piece of gold money was always known in Greece by his

Atossa.

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system of grouping of problems herein set forth, I am induced to offer this work, in the hope that it may be found of value, both to teachers in instructing large sets or classes, and also to individual students. It is also hoped that it will enable the latter to make rapid progress when the assistance of a teacher cannot readily be obtained. An additional reason for presenting this work at this particular time is that under the new conditions for admission to Woolwich and Sandhurst a certain amount of Solid and Descriptive Geometry has to be prepared, full instructions on which are given in Volume II. of this work.

In order that the student may have before him a standard of draftmanship which he may readily reach, the diagrams of this work are from photographs of drawings made by the author and his assistants.

EDMD. C. PLANT.

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BY

J. HUMPHREY SPANTON

GOLD MEDALLIST OF THE ROYAL ACADEMY
INSTRUCTOR IN DRAWING TO THE NAVAL CADETS

London
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NEW YORK: THE MACMILLAN COMPANY

PREFACE

THE Author, in introducing this work to the public, feels that, notwithstanding the many books on the subject already existing, there is still room for one that comprises the whole course of Perspective treated in a comprehensive manner, with the allied subjects of Projection of Shadows and Reflections.

The Art of Perspective is one in which the Author has had many years' experience, both as a teacher as well as in its practical application; he consquently feels that he is not unqualified to deal with this subject in all its branches.

The design of the work is to provide information on Perspective to every class; to those who require the rudiments of the subject, as well as to those who desire a complete course of instruction. There are many students desirous of obtaining sufficient knowlege of Perspective to enable them to sketch correctly, and to test the accuracy of their drawing, but at the same time with a strong aversion to plodding through a series of dry problems to obtain this information. To meet the requirements of this class of students, the whole subject has been explained in the form of an introduction in simple language, with illustrations from familiar objects—the elementary portion in Chapter II.; and the more advanced part of the subject in Chapter IX. If these chapters are carefully studied, they will impart sufficient knowledge of the principles of the subject to enable them to utilise the laws of perspective.

Those, on the other hand, who require a thorough course, will find it in Chapters II.-XI.

Another portion of the work is devoted to the practical application of perspective, and this the Author hopes will be found useful to Artists as well as to Students.

The book contains all the necessary information for the Science and Art Examinations, the Oxford and Cambridge Local Examinations, and those of the College of Preceptors.

PRESS OPINIONS

Educational Review.—"This is an excellent book on the theory and practice of perspective, and will be found very useful to teachers and students of drawing, industrial, scientific, or artistic. The work covers a wide area of instruction, comprehending as it does linear perspective, the projection of shadows and reflections, aerial perspective, and photographic perspective, besides various useful hints not generally found in books on this subject. The method of arrangement and sequence of the chapters will be helpful to those who have not much spare time for study; every statement of theory or fact is set down with commendable clearness and brevity. The chapter on 'Aerial Perspective,' and that entitled 'Perspective Hints to Artists,' will be welcome aids to amateurs in drawing or sketching from nature. At the end of each chapter are questions, the answering of which will be good exercise, and accurately test the knowledge acquired by the student. The illustrations, where the subject permits, are more artistic than are the ordinary diagrams in works on this subject—a concession to the æsthetic sense for which one should be truly thankful."

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MANUAL TRAINING

WOODWORK

A Handbook for Teachers

BY

GEORGE RICKS, B.Sc. LOND.

INSPECTOR OF SCHOOLS, SCHOOL BOARD FOR LONDON; EXAMINER IN MANUAL TRAINING, WOODWORK, TO THE CITY AND GUILDS OF LONDON INSTITUTE

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PREFACE

It is now many years since I called attention to the importance of training the manual and visual faculties of children, in connection with the mental, in our public elementary schools; and, to point the way, I arranged, in 1887, a series of occupations specially designed for the purpose, under the title of "Hand and Eye Training." One of these occupations was working in wood with carpenter's tools; but the scheme—the first published in this country, so far as I know—viewed in the light of ten years' practice, now appears crude, and wanting in gradation. I have watched this particular occupation, and noted its progress from the beginning, not only in London but in many of the large provincial towns, and the following pages embody the results of my riper experience. The book has been written specially for Teachers. I am indebted to my colleague, Mr. J. Vaughan, for many of the Drawings.

GEORGE RICKS

INTRODUCTION

In the preparation of any scheme of manual training we must carefully consider the special *aims* which we have in view, and the *means* by and through which we may hope to achieve our purpose.

Manual Training in Woodwork, as a general educational agent, owes its origin to the Swedish Slöjd, and nearly all the various schemes which have been brought into use in this country during the last decade have their foundations laid in the Swedish system. Herr Salomon, the great exponent of Slöjd, claims that the *aim* in the Swedish scheme is three-fold: 1. *Mental.*—To quicken the intelligence, and to stimulate the perceptive faculties in such a manner as to call forth the child's powers of accurate observation, and careful comparison. 2. *Moral.*—To encourage and strengthen habits of diligence, perseverance, love of order, neatness, self-reliance, and a respect for honest labour. 3. *Manual.*—To develop activity of body, dexterity of hand, and accuracy of eye. The *means* to satisfy these *aims* are cutting-tools, with wood as the medium. Definite courses of tool-exercises[1] are laid down, and

[1] Usually called *models*.

the essential principles upon which the schemes are based, and on which they are to be worked, are clearly enunciated. The more important of these principles may be thus summarized :—They should be sufficiently many and varied to develop an all-round general dexterity; they should be in harmony with the pupil's strength, and physical endurance; they should be simple enough for the pupil to execute without *direct* help from the teacher; and, while being sufficiently difficult to ensure thought and cultivate patience, they should not be so difficult as to discourage. They should be of such a nature as to admit of neatness and exact finish, and they should tend to develop the sense of form and beauty. And, lastly, the series ought to progress without a break from the easy to the more difficult, from the simple to the more complex; and the gradation of the exercises must be of such a nature that the pupil is able to produce any one from the skill he has acquired in working the preceding.

It will be manifest from this short *résumé*, that the principles which claim to underlie Slöjd must, to a large extent, form the fundamental basis of any good system of Manual Training in Woodwork; or, indeed, in any other material.

We must be careful, however, not to confound, as is often the case, the series of exercises with the Slöjd system. The exercises are but the *expression* of the system, and other exercises may serve equally well for this expression. Herr Salomon has been specially careful not to lay claim to infallibility for the Slöjd exercises. All he demands is, that whatever series of exercises is adopted, it shall be constructed in accordance with Slöjd principles.

Following the example of Herr Salomon, we must, first of all, set forth clearly the aims and principles which are to constitute our guides in the preparation of a scheme of Manual Training in Wood. Secondly, we must set forth a graduated scheme of exercises in accordance with our principles.

Our aims, then, must be wholly educational. We must arouse interest, and quicken intelligence. We must develop and strengthen habits of attention, industry, and perseverance. We must train the eye to accurate observation, and the hand to dexterity in execution.

Our principles may be enunciated as follow :

(*a*) Drawing must be the fundamental basis, and an integral part of the whole scheme. Working-drawings, constructed to scale,

must be made of every proposed piece of work. All work must be executed to exact measurement; and every piece of wood must be correctly lined out before being cut.

(*b*) The material selected must be such as will facilitate neat and accurate workmanship; and, together with the tools, must be suited to the physical powers of the pupil. Good work cannot be done with unsuitable or poor tools and materials.

(*c*) The pupil must acquire an intelligent knowledge of the various woods in which he works, of the tools with which he works, and of the general principles which underlie every process.

(*d*) The exercises must be such as will excite interest; they must be carefully graduated, proceeding by easy steps from the simple to the complex; they must be sufficiently difficult to ensure care and thought, but not so difficult as to discourage; and one exercise must be completed to the satisfaction of the teacher before another is attempted, otherwise a careless habit is acquired. Failure should be followed by another exercise of the same kind.

The teacher will note that, in the above enumeration, the use of working-drawings to scale plays a more prominent part than in the Slöjd. The fact is some of the Slöjd exercises do not freely lend themselves to manipulation from simple working drawings, and models are used to supersede them. In the scheme which follows, exercises are substituted which afford opportunity for good drawing lessons. In the second place, he will note that an intelligent knowledge of tools, materials, and processes, holds a more conspicuous place than in the Slöjd.

Separate chapters are devoted to Drawing as the basis of Manual Training in wood, and to facts concerning materials and tools on which Object Lessons, to be given during the course, can be based.

Pupil Teacher.—"The author has gone to the fundamental principles, and has worked step by step through an extensive scheme; the part of the book dealing with drawing should be read by all teachers of wood-work. The chapters dealing with tools, timber, the requirements to fit up a class, and the appendix on cardboard stamp this as a standard work. The exceptionally well-executed diagrams make the instructions very easy for even the private student to follow. This is decidedly the best book we have seen on the subject."

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EXTRACT FROM INTRODUCTION

In publishing the following exercises I hope to place in the hands of every teacher who may use them the means of giving the children under her care healthy and pleasant daily drill, and thereby developing not only the bodily organisms, but indirectly, though no less surely, the intellectual and moral life. "Life without health," says Longfellow, "is a burden, with health is a joy and gladness;" and again another writer, "The body must be healthy in order to obey the soul," and this is proved most forcibly by the fact that the mind cannot during this life exercise its powers or express itself except by means of the bodily organs; and in proportion as these organs are made by health the faithful and helpful servants of the soul and brain, do they minister to the healthy growth of the highest life of man, enabling him to accomplish his life's work, through the means of which he finds his highest happiness and truest good.

It is in the realisation of this interdependence of body, mind, and soul training, and the intelligent use of activity in all these directions that the newer education consists, as opposed to the suppression by neglect of one and the exaltation and simulation of another. If we will only learn from Nature we shall say with Browning—

> "All good things
> Are ours, nor soul helps flesh more now than flesh helps soul!"

No good work in education can be done except in so far as we put ourselves completely in accordance with the divine arrangement. The body the servant of the mind—subject to it—but inasmuch as it *serves*, demanding and deserving the greatest consideration and care from the one it serves.

All will admit that regular and suitable exercise is as essential to perfect health as is nutritious food, fresh air and cleanliness; and it is not only expedient but the bounden duty of every head mistress and master to make the school years of those entrusted to their care the healthiest as well as the happiest period possible. Children under fourteen should not be confined longer than an hour at a time, nor more than four hours a day, and all the serious mental work should be got through in that time. I believe in this statement I should be supported not merely by a majority of our medical men, but *unanimously*. For vigorous growth, absolute freedom is essential; and if the blood is pure and rich the brain will be the first organ to derive benefits, and the four hours carefully planned and used will bring forth more valuable fruit than the orthodox five hours of school with the two or three hours for home lessons.

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THE SCHOOL WORLD

A MONTHLY MAGAZINE OF EDUCATIONAL WORK AND PROGRESS

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THE SCHOOL WORLD is a monthly illustrated Periodical designed to interest and assist all who are engaged in educational work. Its essential object is to afford a **practical aid in teaching**, and all other matters are strictly subordinated to this end.

Among the subscribers to THE SCHOOL WORLD are professors, lecturers, and demonstrators in University Colleges, Training Colleges, and Technical Institutes; schoolmasters and schoolmistresses in the great Public Schools, Grammar Schools, High Schools, Private Schools, Higher Grade Schools, and Public Elementary Schools; as well as private tutors and others employed in educational pursuits.

The Magazine has found its way into every English-speaking country in the world, and is everywhere accepted as the medium for the expression of the views of leading British educationists upon the aims and methods of teaching.

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2. Its articles are written by experienced teachers and are, therefore, practicable as well as practical.
3. Difficulties of organisation and administration are discussed by writers who have overcome them.
4. Helpful suggestions are given in notes on lessons, and test-papers are provided as a convenient and time-saving means of periodically examining the work of forms.
5. All important changes affecting the work and position of teachers are recorded.
6. Every contribution is of direct interest and service to all who are engaged in educational work.

As examples of articles which have already appeared, on various sides of educational work, the following may be mentioned:—

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Geography as a Means of Education. By GEO. G. CHISHOLM, M.A., B.Sc.

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A Century's Progress in Science.

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The Teaching of the Deaf.

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IV. TEST PAPERS.

To provide teachers with questions upon the most popular subjects of the various public examinations, test-papers are published every month, and can be obtained separately at a small cost for distribution to pupils. The examinations for which monthly test-papers have already appeared are:—London Matriculation; Oxford Senior, Junior, and Preliminary Locals; Cambridge Senior, Junior, and Preliminary Locals, and College of Preceptors.

Numerous letters from teachers testifying to the value of these papers have been received, and it is intended to extend the system to other examinations. Arrangements are being made for papers covering the chief subjects of the following examinations, to appear a month or so before the particular examination to which they refer:—Examinations of the Central Welsh Board; Leaving Certificate Examination of the Scotch Education Department; Oxford and Cambridge Joint Board Examination.

V. PRIZE COMPETITIONS.

To obtain information on points of interest to teachers, a number of competitions, with book prizes, have been held. Some of the subjects of these competitions were *The Twelve Most Popular Books in School Libraries*, *The Most Popular School Subjects*, *The Greatest Teachers of the Century*, *The Ten Noblest Men in British History*, *The Most Popular Books of the Year*, *Answers to History Questions*, *Answers to Geography Questions*, *English Essays*, *etc.*

VI. OTHER FEATURES.

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PREFACE

In times past it was considered that the chief, and indeed almost the only, qualification necessary in a teacher was a knowledge of the subject to be taught. A knowledge of child nature and of the principles of the working of the mind was not considered at all essential. The tendency of the present day is to go to the other extreme, and regard a knowledge of psychology as being the only qualification that a teacher should bring to his work. The correct view seems to be that the ideal teacher should not only be well versed in the subjects he is required to teach and in the principles of psychology, but should also have studied the relation of subject matter to mind. He should have considered carefully the effects that the subject is calculated to have in the development of the pupil's mind, and how the subject may best be divided up and presented so as to produce those effects. In the hope of assisting their fellow-teachers in their work on these lines, the authors have undertaken the present book, which they trust will be found in agreement with the latest developments in psychology, although its technicalities have been avoided as far as possible. They must not be understood, however, to depreciate in any way the value of a knowledge of this important subject. Every earnest teacher should give close attention to the study of it, and should strenuously endeavour to apply its teaching, and, in addition to this, he should endeavour to gain an intimate acquaintance with the lives and work of the great teachers of the past. Such wider reading will, we are sure, result in an increased interest and enthusiasm in the more commonplace duties with which this book is more directly concerned.

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began the nightingale's song. I was amazed and astonished at what I heard. The notes he produced were exactly like those of the nightingale, particularly the high and sweet note, "Water bubble," or "Wheet, wheet," followed by the deep-sounding "cur-r-r-r"—the challenge of the male bird to his rivals. The *male* nightingales come over at least a week before the females, and if they are caught *before* the arrival of the females, they will live and do well under proper treatment—but it is not everybody who is going to make them live. After the arrival of the female, not one in a thousand will live. Dr. M'Lean of Colchester, my friend Mr. Coulson tells me, had a nightingale in a cage *twenty-three years*. This was an old bird when he caught it.

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"We were now arrived at Spring Garden, which is exquisitely pleasant at this time of the year. When I considered the fragrancy of the walks and bowers, with the *choirs of birds* that sung upon the trees, and the

[SPECIMEN PAGE]

this point, a gentleman who has been much engaged in engineering works in Holland, informs me that the canals and ditches in some of the Dutch towns smell most offensively till the water becomes green, and then the smell disappears: the same thing that happens in the Serpentine happens in Holland. I have lately seen a blue book containing drawings of the little beasts and the vegetable matter from the Serpentine. These little animalculæ are generally looked upon as being the cause of all the foulness of the Serpentine, but the saddle is put on the wrong horse. If these little creatures and plants did not come into existence, the miasma from the decaying matter would be insupportable. The Serpentine is capable of being improved in many ways, into which it would be foreign to the subject now to enter.

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